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Soil and Air Temperatures for Different Habitats in Mount Rainier National Park

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Abstract

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This paper reports air and soil temperature data from 10 sites in Mount Rainier National Park in Washington State for 2- to 5-year periods. Data provided are monthly summaries for day and night mean air temperatures, mean minimum and maximum air temperatures, absolute minimum and maximum air temperatures, range of air temperatures, mean soil temperature, and absolute minimum and maximum soil temperatures. A temperature growth index has also been calculated. Temperature lapse rates are given for one major drainage, Nisqually. The objective is to provide these data for the use of managers, field scientists, and modelers.

Keywords: Temperature (air), temperature (soil), habitat types, Washington (Mount Rainier National Park).

Research Summary

Thermographs were installed at 10 sites in Mount Rainier National Park, Washington. The 10 sites represented different habitat types, the four corners of the park, and a gradient in elevation. Soil and air temperatures were recorded for 2 to 5 years.

The following are calculated for each thermograph site: monthly summaries for day and night mean air temperatures, mean minimum and maximum air temperatures, absolute minimum and maximum air temperatures, range of air temperatures, mean soil temperatures, absolute minimum and maximum soil temperatures.

A temperature growth index (TGI) for the entire year (annual) and for the growing season are computed for each site when data are available. Correlations of annual and growing season TGI to elevation range from 0.59 to 0.99, with a wider spread at higher elevations. Adding a solar radiation factor to each site did not improve regressions between TGI and elevation.

Mean minimum January air temperatures and mean maximum July air temperatures generally decrease as elevation increases. Exceptions occur in cold air drainages and depressions.

Temperature lapse rates for the four sites representing the gradient in elevation are calculated for January and July. These are compared with a long-term (40-year) average for Longmire, a permanent weather station within the park. Winter temperature lapse rates are generally lower than summer rates. This does not hold true for Mount Rainier, perhaps because of the strong maritime influence on winter weather in the park.

Soil temperatures are plotted against elevation for the sites representing a gradient in elevation. A wide variation in January temperatures occurs because of snow depth and duration. Soil temperature lapse rates, like air temperature lapse rates, are greater in winter than in summer.

These data should be useful to managers, scientists, and modelers. Soil and air temperatures, two of the most important environmental values used in ecological studies, are necessary for quantifying the environment and for determining ecological amplitude. They can provide realistic values for ecosystem modeling.

Contents

Introduction

Data on air and soil temperatures are among the most important environmental values used in ecological studies. These data are critical to studies of the relationship between biota and environment, such as determination of ecological amplitude and indicator value of specific plants. Soil and air temperature data are important in quantifying the environment indicated by specific habitat types. This kind of data is essential for identifying soils under the current taxonomic classification. These data have recently been used to provide realistic values for devising physiological and ecological models.

Data on temperatures in forest stands and forest soils are rarely reported. Most climatic stations are in openings and do not include soil temperatures. Among forests the least is known about montane and subalpine environments. The only known data sets of this type have been collected for the United States/International Biological Program study site at the H. J. Andrews Experimental Forest, Oregon (Emmingham and Lundberg 1977); Findley Lake in the Cedar River drainage of the Mount Baker-Snoqualmie National Forest, Washington;[1] and for Mount Rainier National Park, Washington, reported here.

The Study Area

Mount Rainier National Park occupies 96 767 hectares on the western slopes of the Cascade Range in Washington. The dominance of Mount Rainier (4267 m) effectively divides the park into four major drainage systems—Ohanapecosh, White, Carbon, and Nisqually (fig.1).

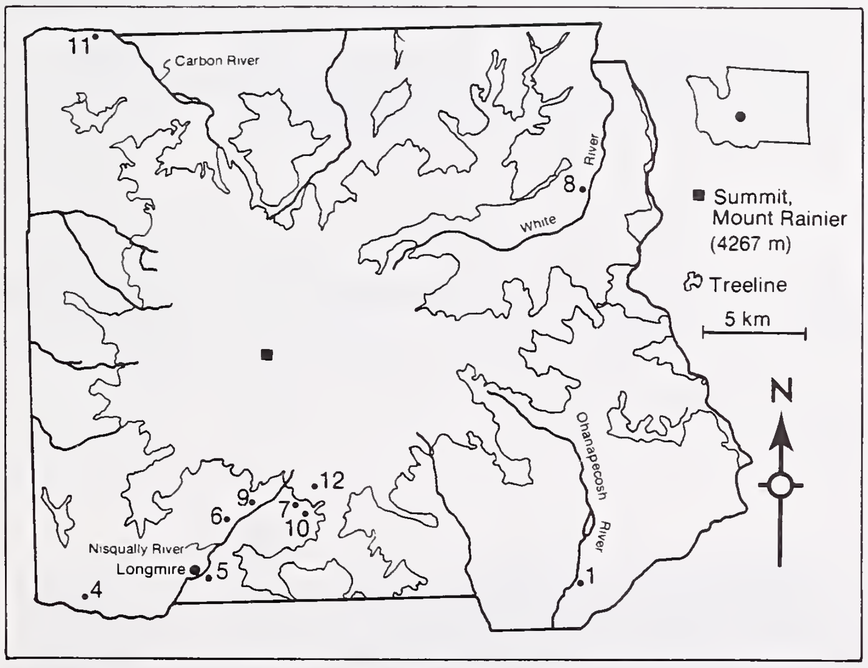

Figure 1.—Mount Rainier National Park. Thermograph sites are numbered. Major drainages are Ohanapecosh, Nisqually, Carbon, and White.

[1] Unpublished data on file, Dean, College of Forest Resources, University of Washington, Seattle.

A diversity of forest types within the park reflects the varied environments of a rugged mountain system. The forests of the park are dominated by *Pseudotsuga menziesii* within the *Tsuga heterophylla-Thuja plicata* climax (Franklin and Dyrness 1973).[2/] There are three forest zones: *Tsuga heterophylla, Abies amabilis,* and *Tsuga mertensiana* (Franklin and Bishop 1969). Franklin and others classified the forest communities in 1975-79.[3/]

Mount Rainier has a temperate, maritime climate. At lower elevations the rainy season lasts from early fall through March or April. At higher elevations snow may begin to accumulate by early November and may last through July. Summers are comparatively dry. Two weather stations, one at Paradise and one at Longmire, have been measuring snow depth and air temperature since the 1920's.

Thermographs were placed in permanent sample plots (sites, 1, 4, 5, 6, 7, 8, 9, 10, 11, 12) located at lower elevations in the four major drainage systems and along a gradient in elevation in the southwest Nisqually drainage (fig. 1). Table 1 shows the permanent sample plot, habitat or forest type, age class, drainage, elevation, and aspect of each thermograph location. Figure 2 represents these stands in an environmental field. Discussion of the sites and presentation of data start with the Ohanapecosh drainage, move counterclockwise to the Nisqually drainage, then up the Nisqually as elevation increases.

[2/] For common names, see "Scientific and Common Names," page 17.

[3/] Franklin, Jerry F.; Moir, William H.; Hemstrom, Miles A.; Greene, Sarah E. Forest ecosystems of Mount Rainier National Park, data on file at Forestry Science Laboratory, Corvallis, OR.

Table 1—Site, age, drainage, elevation, and aspect of thermograph sites at Mount Rainier National Park

Site number and habitat type or open forest	Age	Drainage	Elevation		Aspect
	Years		Meters	Feet	
1. *Tsuga heterophylla/Achlys triphylla*	250	Ohanapecosh	667	2,200	270°
8. *Abies amabilis/Berberis nervosa*	350	White	1050	3,465	300°
11. *Tsuga heterophylla/Oplopanax horridum*	550	Carbon	610	2,013	Flat
4. *Tsuga heterophylla/Oplopanax horridum*	750	Nisqually	636	2,100	Flat
5. *Abies amabilis/Gaultheria shallon*	650	Nisqually	945	3,120	260°
6. *Abies amabilis/Vaccinium alaskaense*	750	Nisqually	1053	3,475	215°
9. *Abies amabilis/Tiarella unifoliata*	350	Nisqually	1136	3,750	160°
7. *Abies amabilis/Rhododendron albiflorum*	330	Nisqually	1424	4,700	145°
10. *Abies amabilis/Erythronium montanum*	300	Nisqually	1424	4,700	175°
12. Paradise (open subalpine forest)	NA	Nisqually	1660	5,480	200°
Longmire Ranger Station	NA	Nisqually	835	2,757	Flat

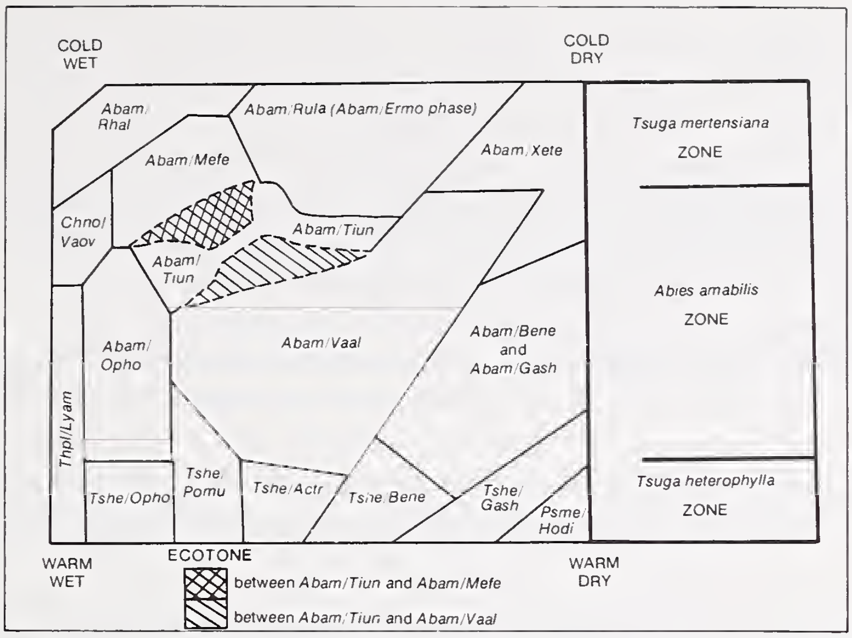

Figure 2.—Distribution of habitat types in relation to an idealized two-dimensional environmental field; horizontal axis represents a moisture gradient and vertical represents a temperature gradient, which (as shown) is closely correlated to elevation and the forest zones on Mount Rainier National Park.

ABAM/BENE = *Abies amabilis/Berberis nervosa* (site 8)
ABAM/ERMO = *Abies amabilis/Erythronium montanum*
ABAM/GASH = *Abies amabilis/Gaultheria shallon* (site 5)
ABAM/MEFE = *Abies amabilis/Menziesia feruginea*
ABAM/OPHO = *Abies amabilis/Oplopanax horridum*
ABAM/RHAL = *Abies amabilis/Rhododendron albiflorum* (site 7)
ABAM/RULA = *Abies amabilis/Rubus lasicoccus* (site 10)
ABAM/TIUN = *Abies amabilis/Tiarella unifoliata* (site 9)
ABAM/VAAL = *Abies amabilis/Vaccinium alaskaense* (site 6)
ABAM/XETE = *Abies amabilis/Xerophyllum tenax*
CHNO/VAOV = *Chamaecyparis nootkatensis/Vaccinium ovalifolium*
PSME/HODI = *Pseudotsuga menziesii/Holodiscus discolor*
THPL/LYAM = *Thuja plicata/Lysichitum americanum*
TSHE/ACTR = *Tsuga heterophylla/Achlys triphylla* (site 1)
TSHE/BENE = *Tsuga heterophylla/Berberis nervosa*
TSHE/GASH = *Tsuga heterophylla/Gaultheria shallon*
TSHE/OPHO = *Tsuga heterophylla/Oplopanax horridum* (site 4)
TSHE/POMU = *Tsuga heterophylla/Polystichum munitum*

The thermograph at site 1 was placed in the Ohanapecosh drainage in a *Tsuga heterophylla/Achlys triphylla* habitat type.[4] This type is confined to low elevations and is found only on the east side of the park. Soils are tephra deposits with weakly developed podzols. Brockway and others (1983) describe a similar type—*Abies amabilis/ Achlys triphylla-Clintonia uniflora*—which probably occurs on cooler and drier sites, as well as being an *Abies* climax type. An *Abies amabilis/Achlys triphylla* type is also described by Dyrness and others (1974).

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[4] Habitat type descriptions are from Franklin and others (unpublished, see footnote 3) unless otherwise noted. Establishment reports for each permanent sample plot are on file RWU-1251, Forestry Sciences Laboratory, Corvallis, OR, and at Mount Rainier National Park, Tahoma Woods, Ashford, WA.

The thermograph at site 8 was placed in the northeast corner of the park, White River drainage, in an *Abies amabilis/Berberis nervosa* habitat type. This type occupies moderately dry, sometimes steep slopes. Colluvium and tephra are the usual soil parent materials. Soils are generally shallow and stony. Brockway and others (1983) do not mention such a type. Franklin (1966) discusses this type, which is comparable to *A. amabilis/Berberis nervosa* (Hemstrom and others 1982) and to *Tsuga heterophylla-A. amabilis/Rhododendron macrophyllum/B. nervosa* habitat types found in the Oregon Cascade Range (Dyrness and others 1974).

The thermograph at site 11 was placed in the Carbon River drainage, the wettest section of the park. This thermograph was in a *T. heterophylla/ Oplopanax horridum* habitat type which occupies wet benches, terraces, and lower slopes at low elevations in the park. Soils are alluvium in origin and lack distinctive horizons. The existence of *Picea sitchensis* in this stand sets it apart from other stands of this type in the park. The Carbon River drainage is one of the few inland sites where this coastal spruce is found.

Thermographs at sites 4, 5, 6, 7, 9, 10, and 12 are in the Nisqually drainage. The thermograph at site 4 was also in the *T. heterophylla/O. horridum* habitat type. This stand had more stems per hectare and less dead and down woody material than did site 11.

The thermograph at site 5 was in the *A. amabilis/Gaultheria shallon* habitat type which occurs primarily in the western half of the park in a transition zone between *T. heterophylla* and *A. amabilis.* Soil parent material is tephra and alluvium. This type is generally found on moderate to steep, southerly exposed, middle and upper slopes, dominated by *Tsuga* and *Pseudotsuga*. It corresponds with Brockway and others' (1983) Pacific silver fir/*salal association,* with Franklin's (1966) *A. amabilis/G. shallon* type, and with Hemstrom and others' (1982) *A. amabilis/Vaccinium alaskaense-G. shallon* association. Brockway mentions the common occurrence of *A. procera* in these stands.

The thermograph at site 6 was in the *A. amabilis/V. alaskaense* habitat type, the most prevalent community in the park. It is a modal type that occupies environments lacking extremes of temperature and moisture. Because the type is so widespread, various phases occur. Soils are deep, well drained, and commonly podzolic. Though usually found in tephra deposits, the soils may also be developed in colluvial, alluvial, or laharic parent material. Brockway and others (1983) describe a Pacific silver fir/Alaska blueberry association in similar terms, though they found *Abies* more dominant in the understory. The type is also described by Dyrness and others (1974), Franklin (1966), and Hemstrom and others (1982).

The thermograph at site 9 was on a steep slope in the *A. amabilis/Tiarella unifoliata* habitat type. This is an herb-rich community found primarily on mesic mountain slopes at middle elevations. Soils, developed in tephra or colluvium, are deep and well drained with no evidence of iron-pan development. Brockway and others (1983) and Hemstrom and others (1982) describe this type in similar terms, though they found generally more shrub cover. Franklin (1966) describes this type for the Mount Adams area.

The thermograph at site 7 was in the *A. amabilis/Rhododendron albiflorum* habitat type, a community found on wet slopes and benches at cold, higher elevations. Snowpack may last into the summer. Soils are usually podzolic with high water tables and saturated conditions most of the year. The overstory is codominated by *Tsuga mertensiana, Chamaecyparis nootkatensis,* and *Abies* spp. Brockway and others (1983) describe a

similar community with less emphasis on *C. nootkatensis,* and the addition of *A. procera* and *T. heterophylla.* They mention that the soil profile is generally rocky, with an effective rooting depth of 74 cm. A similar association, *A. amabilis/R. albiflorum/Clintonia uniflora,* occurs in the northern Oregon Cascades (Hemstrom and others 1982).

The thermograph at site 10 was situated in the wet and cold *A. amabilis/Erythronium montanum* phase of the *A. amabilis/Rubus lasiococcus* habitat type. Soils in this phase are developed in tephras. Soil profiles vary from little profile development to strong horizons. Brockway and others (1983) do not mention a similar phase or association. The only close type is described by Fonda and Bliss (1969) for similar stands in the northeast corner of the Olympic Peninsula.

The thermograph at site 12 was at Paradise in open subalpine forest of *A. lasiocarpa.* No habitat type is described for these open forests.

Methods

In the spring and summer of 1978, 10 thermographs were installed in permanent sample plots in the park (sites 1, 4, 5, 6, 7, 8, 9, 10, 11, 12). Each thermograph has air and soil probes that provide for a continuous trace of the temperatures on circular charts. The air probe is placed underneath an A-frame shelter (1 m high) to protect it from sun, wind, and rain. The soil probe is buried 20 cm below the soil surface, parallel to the ground. Thermographs run for approximately 30 days between clock windings.

All thermographs were serviced through 1980, and four (sites 4, 5, 6, 7) were serviced through 1982. The thermograph at site 10 did not function correctly until 1979. Thermographs at sites 9, 10, and 12 were buried under heavy snow during much of the winter, and servicing was generally done from May through November. In 1980 the thermograph at site 9 had mechanical malfunctions. The thermograph at site 11 in the Carbon River was serviced on an irregular basis because of lack of available personnel.

The charts are digitized and the data summarized by use of a computer program, CIRC (1981),[5] that calculates day and night means, ranges, minimums, and maximums for air temperature; average soil temperatures; and cumulative temperature growth index (TGI).

Another computer program, METMEAN, provides monthly summaries of all the data. These programs were adapted for the CPM operating system and Microsoft Fortran 80. Programs are available from site director at the H. J. Andrews Experimental Forest, Blue River, OR 97413.

Daily data are too voluminous to publish. They are available from Data Bank Manager, Forest Science Department, Forestry Sciences Laboratory, Corvallis, OR 97331.

From Cleary and Waring's (1969) temperature summing algorithm, daily TGI values are summed over each growing season for every site. The TGI allows comparisons among stands based on a model of how average daily soil temperature and average daylight air temperature affect growth of Douglas-fir seedlings.

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[5] Bierlmaier, Fred. CIRC. Blue River, OR: H. J. Andrews Experimental Forest; 1981.

Growing season, as defined by Cleary and Waring (1969), is the period when new cells are produced by the secondary cambium. This stage includes the development of new foliage and the later phase when only secondary cambial activity occurs. To determine this in the field is a painstaking process. After much work in the Siskiyou Mountains and in the greenhouse, Waring feels that the growing season safely begins when soil temperatures have remained at 4°C or above for 7 consecutive days.[6/] In the Siskiyous the growing season ends in mid-September. Soil temperatures do not drop, rather day length decreases sufficiently to inhibit growth. A small amount of annual cambial growth (<5 percent) may occur after this. Because the park is at a latitude of 46½°N compared to 42½°N for the Siskiyous, we used mid-September as a conservative estimate for the end of the growing season.

Lack of personnel, inaccessibility of several of the sites, and occasional mechanical malfunctions resulted in missing data for some sites. Few gaps occur for the sites in the Nisqually drainage. The largest gaps are found at site 11 because of irregular servicing, and at the higher elevation sites (9, 10, 12). Most of these latter gaps occur in the winter months, not in the growing season. Because TGI requires that soil and air temperatures be measured daily, the values for missing data had to be estimated.

To fill these gaps, data from thermographs at similar elevations and aspects were compared by use of regression analysis. The best r^2's (usually greater than 0.80) were chosen, and the regression equations were used to fill in the missing data. New summaries and cumulative TGI's were then run.

Temperature lapse rates—the decrease in temperature with increase in elevation—for the sites in the Nisqually drainage were calculated and compared with the long-term (40-year) average at Longmire (U.S. Weather Bureau 1978-82). Correlations between Longmire and all Nisqually sites were made for maximum and minimum January and July daily air temperatures from 1978 to 1982. From the resulting regression equations and the 40-year average data for Longmire, the 40-year averages for the Nisqually sites were estimated. Temperature lapse rates were then obtained by regressing the estimated temperatures against elevation. Lapse rates are generally calculated in open stands; for our purposes we used closed canopy stands. Two lapse rates were actually calculated; one included site 12 (the open stand), and one excluded it.

Temperature lapse rates for soils in the Nisqually drainage were also determined. These were calculated by regressing the mean soil temperatures for 4 years with elevation.

Results and Discussion

Daily Data

Daily data from the thermographs are presented in the appendix as monthly summaries for each site and year.

[6/] Personal communication, Richard Waring, Forest Science Department, Oregon State University, Corvallis.

Temperature Growth Index

Number of growing season days and growing season TGI's vary from year to year (table 2). Because the actual beginning and end of the growing seasons are not known, especially for contrasting habitats, the calculated TGI's are only estimates. It is also fairly well established that conifers, unlike hardwoods, may continue photosynthesizing during the winter months if soil and air temperatures are favorable (Emmingham and Waring 1977). Thus, a growing season TGI may tell us more about hardwoods and deciduous herbs and shrubs than about conifers; table 3 shows the annual TGI for the entire year (the total accumulated throughout the year). Photosynthesis is possible any day that does not have freezing temperatures, so total number of frost free days is given for each site in table 4.

Table 2—Number of growing season days and growing season temperature growth index (TGI) for all thermograph sites at Mount Rainier National Park, except 11

	1978 1/		1979		1980		1981 2/		1982	
Site number	No. days	TGI	No. days	TGI	No. days	TGI	No. days	TGI	No. days	TGI
1	121	59.1	133	67.9	141	63.1				
8	121	53.9	133	55.3	136	50.7				
4	122	59.9	138	66.9	147	64.3	141	62.4	124	61.2
5	121	54.0	117	56.5	136	55.4	112	56.6	119	49.8
6	99	43.6	119	53.0	128	52.6	121	57.0	93	45.3
9	95	41.3	98	45.0	125	47.1				
7	99	37.5	98	40.7	125	51.3	103	44.9	80	31.9
10			64	29.0	67	26.5				
12	58	23.1	116	42.6	83	33.0				

1/ Does not represent an entire growing season. Site 10 thermograph was not installed until 1979.

2/ Thermographs for sites 1, 8, 9, 10, and 12 were discontinued.

Table 3—Annual temperature growth index at sites at Mount Rainier National Park

Site number	1978 1/		1979, 365 days	1980, 366 days	1981, 2/ 365 days	1982, 365 days
1	79.8	(230)	96.4	91.8		
8	71.3	(230)	77.6	74.6		
11	3/		77.1	81.7		
4	80.6	(331)	103.8	97.6	100.5	88.6
5	75.8	(231)	94.2	90.0	99.6	67.7
6	63.0	(208)	83.1	86.5	88.4	66.6
9	61.9	(208)	73.4	80.8		
7	51.5	(208)	67.2	83.2	68.7	46.4
10	3/		52.1	47.7		
12	37.0	(167)	65.3	57.8		

1/ Thermographs were installed in late spring of 1978; numbers in parentheses are total number of days for 1978.

2/ Thermographs at sites 1, 8, 11, 9, 10, and 12 were discontinued.

3/ Not operable.

Table 4—Total frost-free days during entire year for each site at Mount Rainier National Park

Site number	1979	1980	1981 1/	1982
1	292	293		
8	251	260		
11	317	342		
4	327	341	352	323
5	314	336	350	283
6	289	319	321	253
9	309	335		
7	263	282	267	207
10	245	267		
12	215	226		

1/ Thermographs at sites 1, 8, 11, 9, 10, and 12 were discontinued.

The TGI's for site 7 in 1980 are somewhat high because of abnormally high soil temperatures recorded for this site, especially from February through May. These high temperatures increased the length of the growing season and, consequently, the growing season TGI. Each time a new chart is put on the thermograph the soil probe is calibrated with a hand thermometer reading at 20 cm in the soil. There were no discrepancies between calibration and thermograph reading so mechanical error can be ruled out.

Site 11 data were not always complete because of difficulty of servicing the thermograph. Much of the soil data for February and March of 1980 had to be obtained from regression estimates, so no growing season TGI appears for site 11 in table 2. Soil temperatures for the missing data were high, indicating that the growing season would begin on January 28. This was highly unlikely; thus, only the annual TGI is shown.

Site 10 has lower growing season TGI's and annual TGI's than does site 12 at Paradise which is over 182 m higher in elevation. This may be explained by the open, exposed site at Paradise compared with a closed canopy over site 10. Snow melt occurred nearly a month later at site 10 than at site 12. Soil temperatures for site 10 are consistently lower than for site 12.

The correlation of growing season and annual TGI with elevation (figs. 3 and 4) ranges from 0.59 to 0.99. The wide spread in data at the higher elevation is not entirely surprising. There is generally more structural heterogeneity in stands at higher elevation than in stands at lower elevation, which partially explains the variance of values for the higher sites. The distribution of habitat types on an environmental field (fig. 2) includes the average growing season TGI for 1979 and 1980.

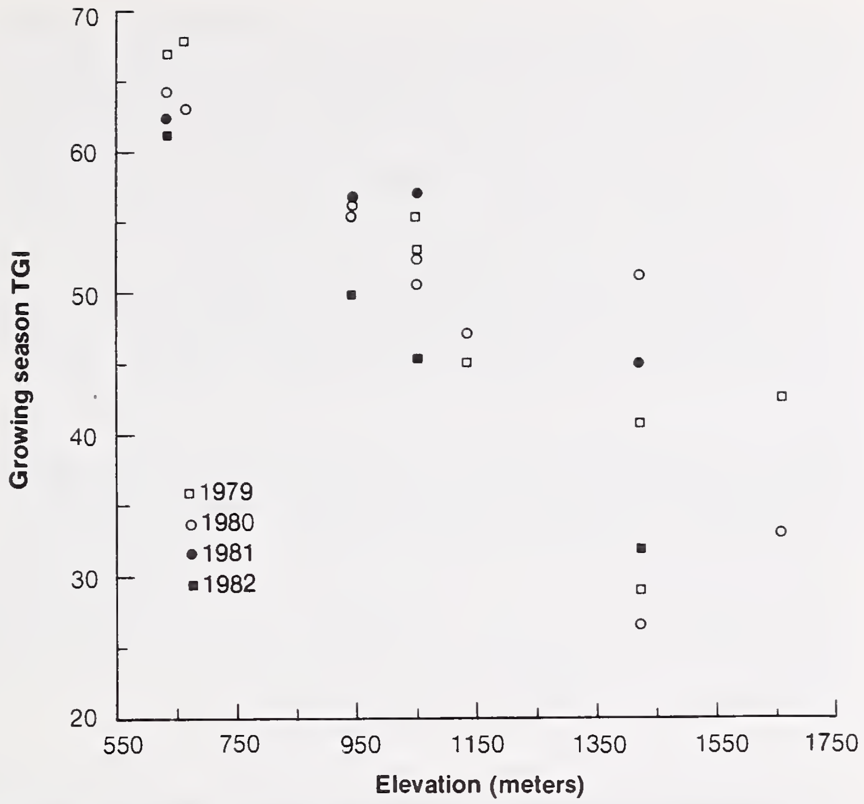

Figure 3.—Growing season temperature growth index for all sites at Mount Rainier National Park, 1979-82.

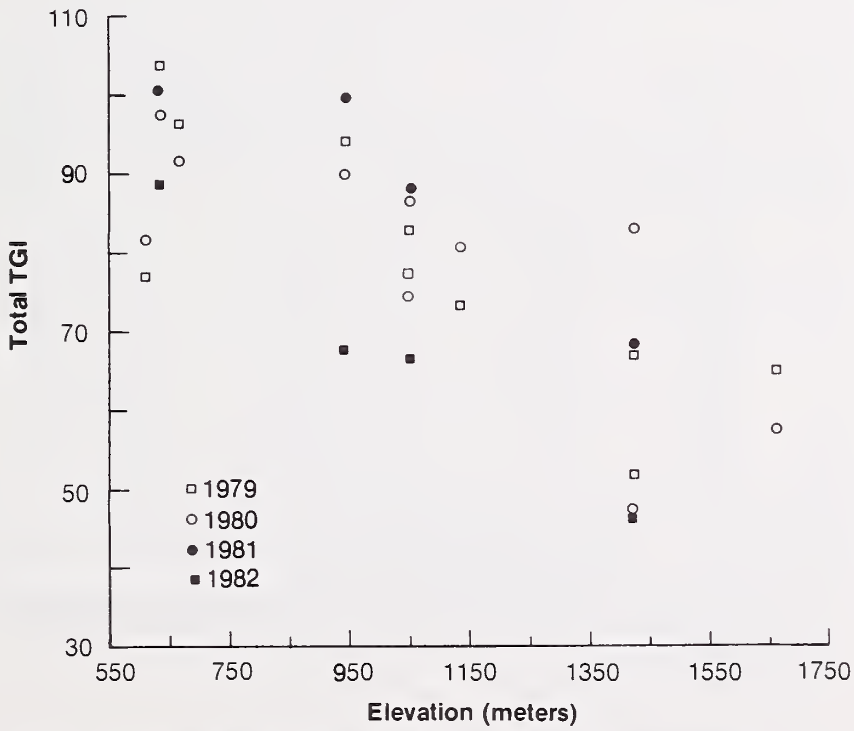

Figure 4.—Whole year temperature growth index for all sites at Mount Rainier National Park, 1979-82.

Variance of annual TGI for sites at low and middle elevations (fig. 4) is greater than that of growing season TGI. Sites at low and middle elevations result in greater TGI throughout the year because of differences in microsite and weather patterns throughout the park. Kaufmann (1984) found considerable local variation in canopy temperature caused by clouds and thunderstorm activity.

So that the regression between TGI and elevation would be improved, multiple regressions were made adding a solar radiation factor for each site. The solar radiation factor was calculated for Julian day 80 from slope and aspect by the method outlined by Swift (1976). The factor represents the fraction of the potential radiation for a horizontal surface that would reach a sloping site. The single value for the equinox (Julian day 80) was selected because it crudely approximates the cumulative radiation factor for an entire year. The radiation factor had no significant impact on the r^2, which suggested that other factors such as snowpack, cold air drainage, and canopy density were more important. The usefulness of the radiation factor was further diminished because of a significant amount of covariance between elevation and the radiation factor.

Mean Air Temperatures

Mean minimum January air temperatures and mean maximum July air temperatures (table 5) generally decrease as elevation increases. Site 6, however, is 83 m lower than site 9, yet it experienced lower temperatures. Site 6 is in a shallowly depressed, cold air drainage, and site 9 is on an east-facing slope, which may account for the difference. The Ohanapecosh site at 610 m may be on one of the colder sides of the park, as is evidenced by temperatures consistently lower than sites at higher elevations in the Nisqually and the White River drainages.

Table 5—Mean minimum and maximum (January and July) air temperatures for all sites at Mount Rainier National Park

		1978, 1/	1979		1980		1981 2/		1982	
Site	Elevation	July	Jan.	July	Jan.	July	Jan.	July	Jan.	July
No.	Meters	°C								
1	667	21.5	-6.6	22.7	-4.5	22.1				
8	1050	20.7	-6.2	21.2	-6.1	20.2				
11	610	3/	-2.3	19.5	-1.8	18.2				
4	636	20.0	-1.4	21.2	-1.7	20.0	4.5	18.6	-.3	19.6
5	945	19.4	-2.6	21.2	-2.5	20.8	4.8	18.9	-.9	19.7
6	1053	18.7	-4.3	20.4	-3.9	20.3	2.5	19.3	-1.8	19.9
9	1136	17.2	-2.6	19.8	-2.1	18.5				
7	1424	18.3	-8.2	18.5	-5.5	18.4	3.3	17.1	-4.7	16.3
10	1424	3/	-9.5	17.2	-6.7	17.0				
12	1660	20.4	-5.6	16.2	-4.3	22.4				

1/ There are no January values because thermographs were installed in the spring.

2/ Thermographs at sites 1, 8, 11, 9, 10, and 12 were discontinued.

3/ Not operable.

Air Temperature Lapse Rates

Yearly temperatures for the sites in the Nisqually drainage and estimated long-term averages for the sites based on the 40-year Longmire data are presented in figures 5-10. Each regression line appearing on the six figures displays a closed canopy temperature lapse rate. The lapse rates between January and July temperatures (table 6) are not significantly different by a pair wise T test. There are two sets of lapse rates shown, one including site 12, the open Paradise site, and one without it.

Bamberg and Major (1968) published data for mean January and mean July lapse rates for several areas higher than 1500 m in Montana, Idaho, and Wyoming in the United States and in the Alps in Switzerland. They comment that winter rates are generally lower than summer rates because condensation of moisture decreases the dry adiabatic rate of 1°C/100 m, and because of winter temperature inversions. Lower winter rates do not hold true for Mount Rainier and did not hold for 2 of the 13 areas they cited. The strong maritime influence on winter weather at Mount Rainier may be one explanation for lower winter rates.

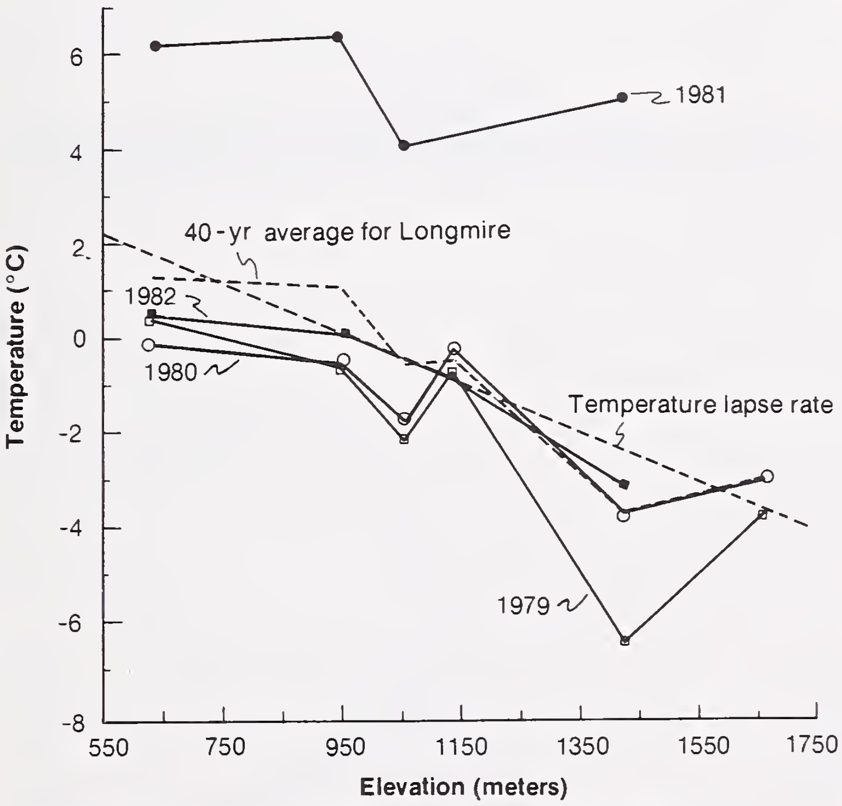

Figure 5.—January mean temperatures for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

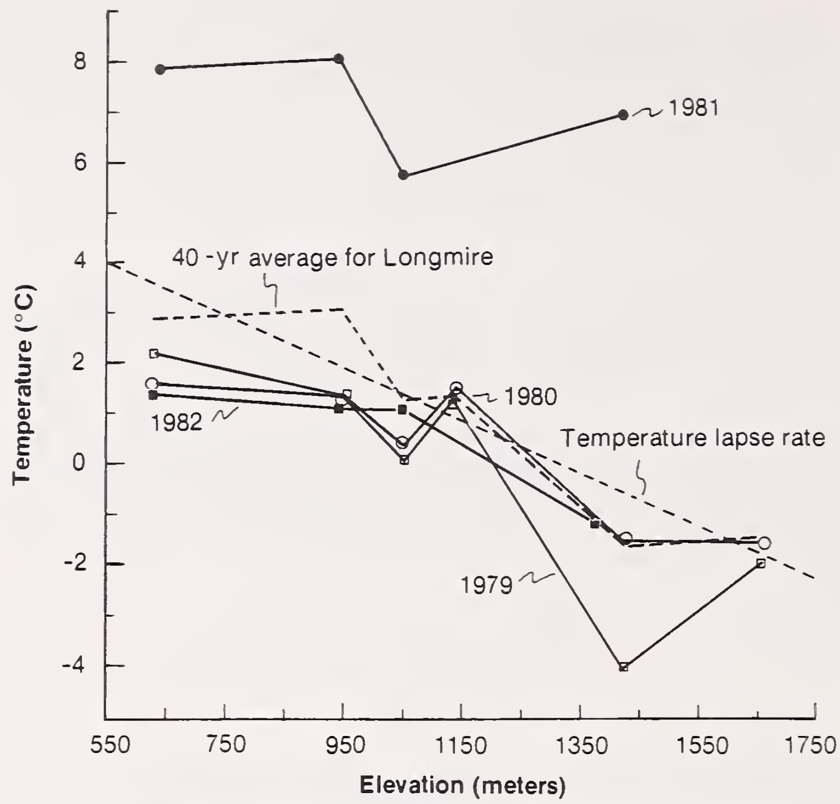

Figure 6.—January mean maximum temperature for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

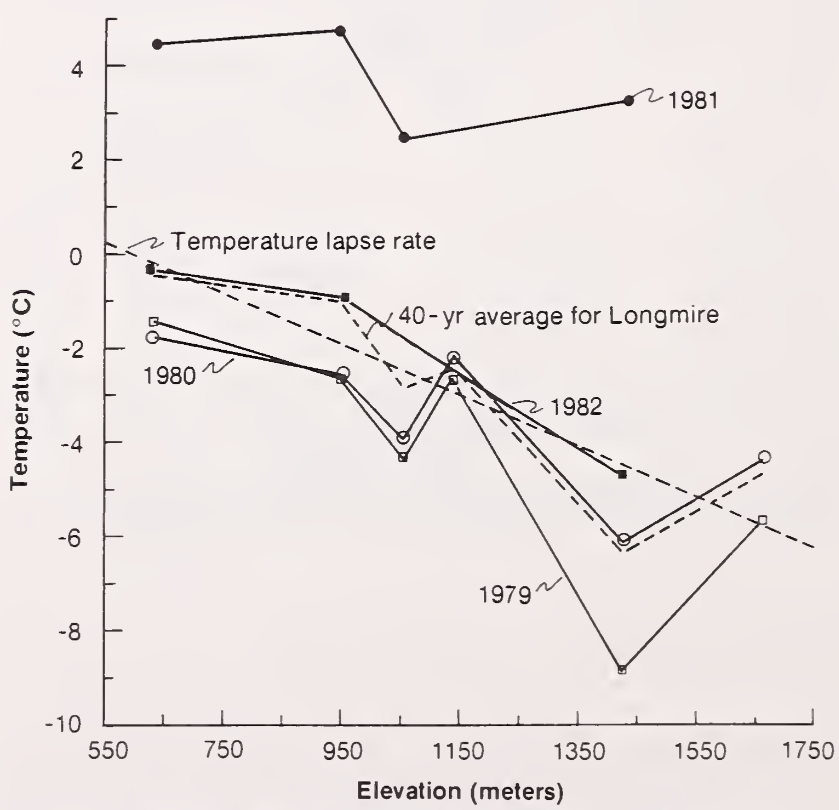

Figure 7.—January mean minimum temperatures for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

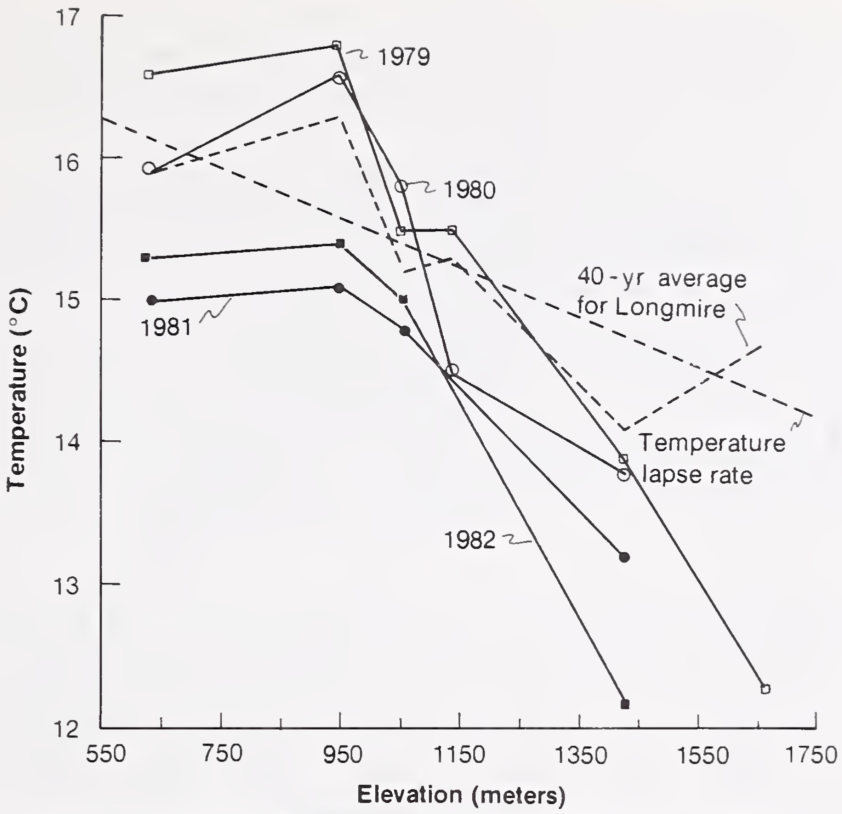

Figure 8.—July mean temperatures for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

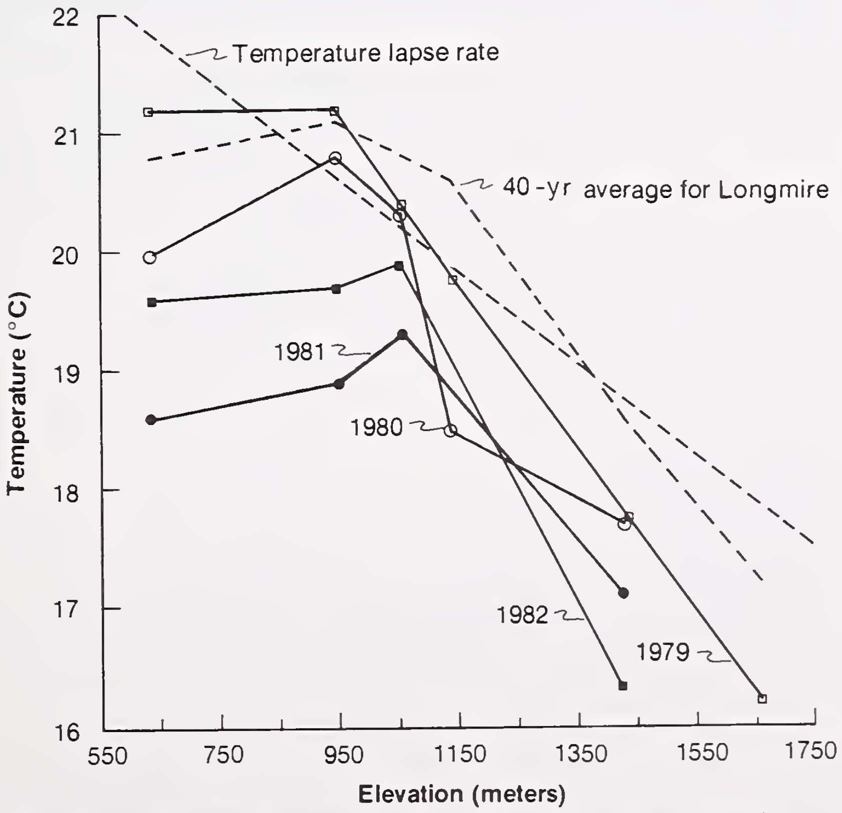

Figure 9.—July mean maximum temperatures for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

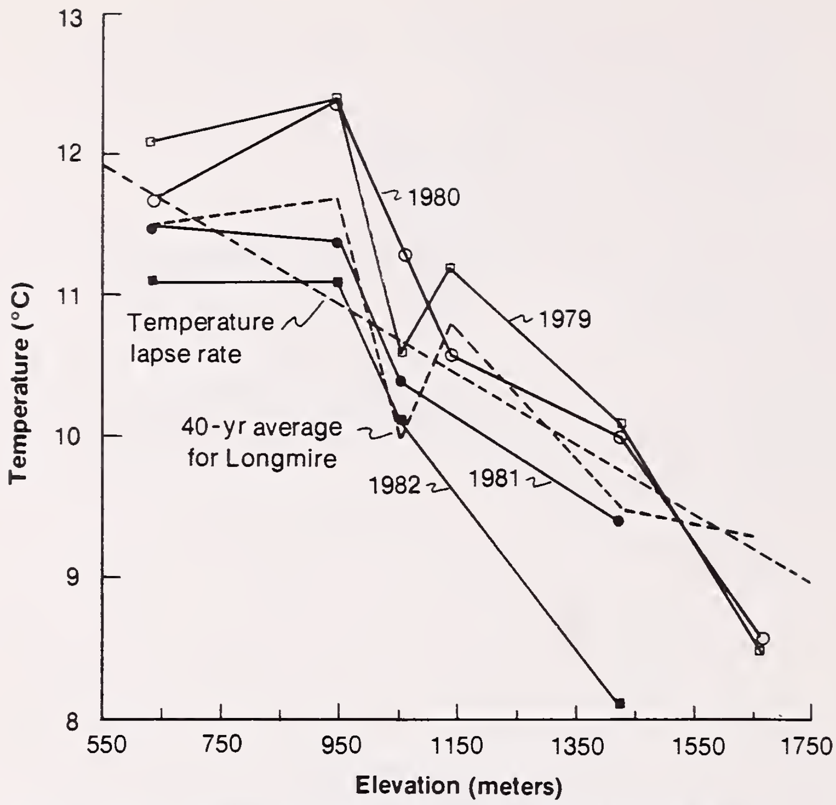

Figure 10.—July mean minimum temperatures for Nisqually sites for 1979-82, the 40-year average, and the temperature lapse rate.

Table 6—Estimated lapse rates for the Nisqually drainage at Mount Rainier National Park

	Lapse rates			
	Air temperature		Soil temperature	
Month	7 sites	6 sites (site 12 excluded)	7 sites	6 sites (site 12 excluded)
	°C/1000 meters			
January minimum	-5.9	-7.9		
January maximum	-5.5	-6.3		
January mean	-5.4	-6.7	-2.46	-2.95
July minimum	-2.5	-2.7		
July maximum	-3.9	-3.2		
July mean	-2.0	-2.7	-1.89	-2.52

Soils

The soil probes were placed 20 cm below the surface to avoid the fluctuations in temperature at the ground surface and to register temperatures in the rooting zone (see footnote 5). Root growth also depends on soil temperature.

Figures 11 and 12 plot soil temperatures against elevation for the sites in the Nisqually drainage. The wide variation in January may be related to difference in snow depth and duration. Soil temperatures in January 1981 were unusually warm; Longmire records show 29 snow-free days,[7] as well as higher than normal air temperatures (fig.7). Sites 7 and 10, at the same elevation and similar aspects, show a wide difference in soil temperature. Site 7 on a steep midslope receives more winter radiation than site 10 in a small depression on a gently sloping bench. Site 7 soils are rockier and conduct more heat. Soil temperatures show less variation in summer and generally decrease as elevation increases. Site 10 has colder soil temperatures and snowpack remains longer than at either site 7 or 12.

Soil temperature lapse rates, like the air temperature lapse rates, are greater in the winter than in the summer (table 6). The r^2 for winter was 0.88, and for summer 0.63. Unlike air temperature lapse rates, the soil temperature lapse rates were calculated from 4-year averages.

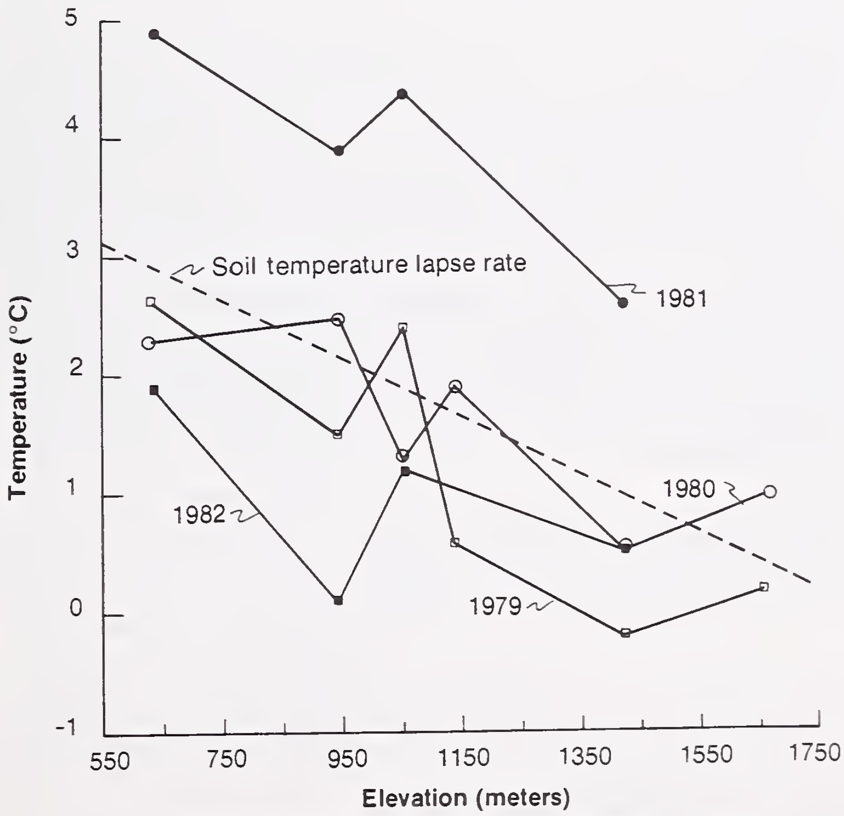

Figure 11.—January mean soil temperatures for all sites for 1979-82.

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[7] Unpublished data on file Mount Rainier National Park, Tahoma Woods, Ashford, WA.

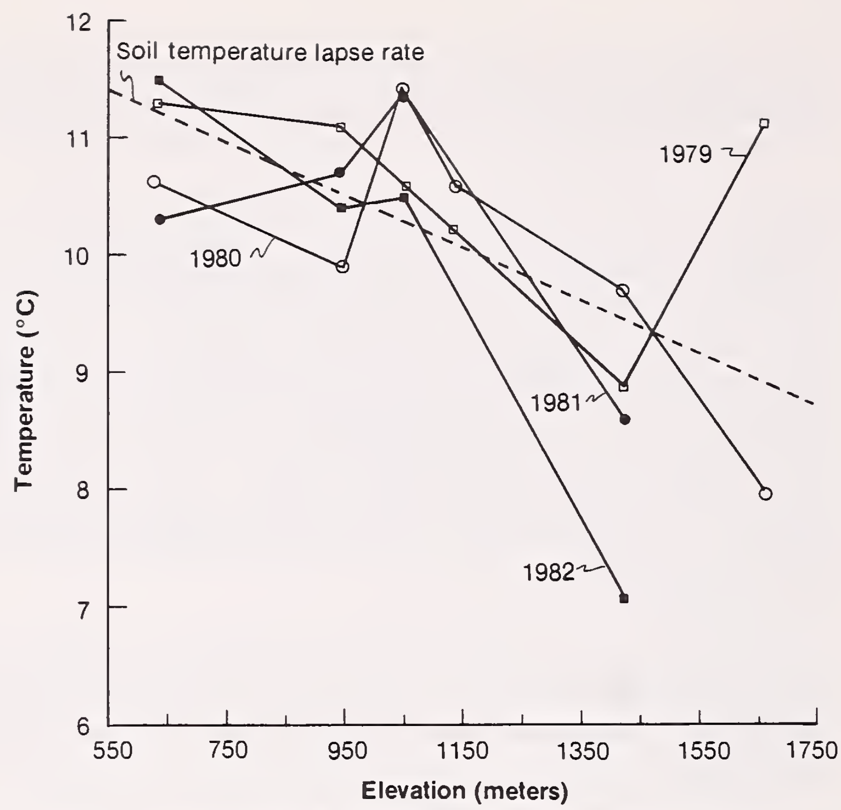

Figure 12.—July mean soil temperatures for all sites for 1979-82.

Conclusion

Because this kind of data takes a long time to gather and is cumbersome to analyze, it seldom appears in the literature. Its importance lies in its usefulness to field scientists and managers in helping to explain the relation between the biota and the environment. Most likely these data will be used by modelers. Modeling formalizes preconceived notions, so the more information available the better the model. These data show, though, that preconceived notions about temperature data are not always reliable; for example, winter lapse rates being lower than summer rates. A better understanding of the relationship between temperature, elevation, topography, and habitat types is needed. The data presented from Mount Rainier provide one more area where these complicated relationships are more clearly understood.

Acknowledgment

We thank the staff at Mount Rainier National Park who braved rain and snow to change the thermograph charts monthly.

Scientific and Common Names[8/]

Scientific name	Common name
Trees:	
Abies amabilis (Dougl.)Forbes	Pacific silver fir
Abies lasiocarpa (Hook.) Nutt.	Subalpine fir
Abies procera Rehder	Noble fir
Chamaecyparis nootkatensis (D. Don) Spach	Nootka falsecypress
Picea sitchensis (Bong.) Carr.	Sitka spruce
Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir
Thuja plicata Donn	Western redcedar
Tsuga heterophylla (Raf.) Sarg.	Western hemlock
Tsuga mertensiana (Bong.) Carr.	Mountain hemlock
Shrubs:	
Berberis nervosa Pursh	Cascade hollygrape
Gaultheria shallon Pursh	Salal
Holodiscus discolor (Pursh) Maxim.	Creambush rockspirea
Menziesia ferruginea Smith	Rusty menziesia
Oplopanax horridum (J. E. Sm.) Miq.	American devilsclub
Rhododendron albiflorum Hook.	Cascades azalea
Rhododendron macrophyllum G. Don	Pacific rhododendron
Rubus lasiococcus Gray	Blackberry
Vaccinium alaskaense Howell	Alaska blueberry
Vaccinium ovalifolium Smith	Ovalleaf whortleberry
Forbs:	
Achlys triphylla (Smith) DC.	Deerfoot vanillaleaf
Clintonia uniflora (Schult.) Kunth	Queencup beadlily
Erythronium montanum Wats.	Avalanche fawnlily
Lysichitum americanum Hulten & St. John.	American yellowskunkcabbage
Polystichum munitum (Kaulf.) Presl.	Western swordfern
Tiarella unifoliata Hook.	Coolwart foamflower
Xerophyllum tenax (Pursh) Nutt.	Common beargrass

English Equivalents

0° Celsius	= 32° Fahrenheit
1 centimeter	= 0.4 inch
1 hectare	= 2.47 acres
1 meter	= 3.3 feet
1 kilometer	= 1.6 miles

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[8/] Nomenclature follows Garrison and others (1976).

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Appendix

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 1

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
5	17	8.7*	7.1*	12.3*	4.7*	22.0*	1.4*	15.3*	8.9*	10.0*	3.8*
6	30	17.1	12.7	20.4	10.7	29.7	6.9	17.2	9.5	12.2	4.3
7	31	17.6	14.1	21.5	11.4	31.8	7.5	15.5	12.4	14.4	10.5
8	31	17.3	14.8	20.5	12.2	32.6	8.0	19.1	13.9	16.1	12.7
9	30	12.9	11.7	14.8	9.8	22.4	4.2	10.1	12.1	13.8	10.5
10	31	10.1	8.4	13.7	5.2	20.6	.5	13.4	10.5	12.2	6.6
11	30	1.6	1.3	3.7	-1.1	13.7	-6.4	8.9	4.1	7.2	1.6
12	31	-2.8	-3.1	-.9	-5.4	4.3	-17.1	11.5	.7	1.1	.5
YEARLY VALUES:	231	10.4	8.4	13.3	6.0	32.6	-17.1	19.1	9.0	16.1	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 1

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-3.3	-3.8	-.8	-6.6	3.0	-15.5	9.6	.6	3.3	-2.2
2	28	-.2	-.4	1.3	-1.9	5.1	-12.6	9.6	.2	1.1	-1.0
3	31	3.8	1.6	6.2	.0	13.3	-4.5	13.4	.0	.5	0.0
4	30	6.5	4.5	8.8	2.8	21.0	.3	16.0	1.6	5.0	0.0
5	31	12.0	11.0	16.7	7.1	26.8	4.0	19.0	6.3	8.3	5.0
6	30	15.1	13.8	20.0	9.7	29.2	4.5	18.4	9.4	12.2	7.7
7	31	18.4	16.6	23.0	12.9	33.8	5.7	15.9	12.8	15.5	8.8
8	31	17.3	16.1	21.1	12.9	27.9	7.5	16.7	13.5	14.4	12.7
9	30	15.0	15.3	19.5	11.0	27.6	6.5	15.8	12.5	13.3	11.6
10	31	11.4	9.2	13.2	7.3	23.7	1.1	14.7	9.0	11.6	5.5
11	30	4.2	3.5	5.9	1.7	10.6	-3.4	10.1	5.3	6.6	3.3
12	31	4.0	3.5	5.2	2.4	9.5	-1.3	6.8	2.6	3.8	1.1
YEARLY VALUES:	365	8.7	7.6	11.7	5.0	33.8	-15.5	19.0	6.2	15.5	-2.2

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 1

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-2.1	-2.3	-.0	-4.5	6.4	-15.8	10.9	1.1	2.7	0.0
2	29	2.4	2.3	3.7	.7	5.8	-5.9	6.6	.8	1.6	.5
3	31	1.3	1.6	3.1	.1	9.1	-4.4	6.2	-.3	4.4	-3.8
4	30	8.4	5.6	11.7	3.4	23.2	-.3	16.1	3.8	6.6	1.1
5	31	11.1	9.8	14.6	6.8	25.2	2.1	20.1	6.9	7.7	6.1
6	30	11.1	11.2	14.3	8.2	21.5	4.5	15.4	8.6	10.0	6.6
7	31	16.9	16.4	22.1	12.0	31.9	8.4	16.5	12.0	14.4	10.0
8	31	15.2	14.7	19.3	10.7	28.6	4.4	16.0	12.3	13.8	10.5
9	30	13.4	12.3	16.9	9.3	25.2	5.4	14.0	10.7	12.2	9.4
10	31	10.7	9.0	14.2	6.2	26.9	1.2	15.3	8.6	12.2	6.6
11	30	4.8	3.9	6.4	2.4	13.3	-.8	9.1	4.8	7.7	2.7
12	31	2.6	2.1	3.9	1.2	12.5	-7.8	6.8	1.7	4.8	0.0
YEARLY VALUES:	366	8.0	7.2	10.9	4.7	31.9	-15.8	20.1	5.9	14.4	-3.8

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 4

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
5	17	9.3*	6.7*	11.9*	4.5*	19.8*	1.6*	13.6*	5.4*	6.1*	5.0*
6	30	15.5	12.3	19.0	10.2	27.2	5.3	15.3	8.9	11.1	6.1
7	31	16.3	14.4	20.0	11.4	30.4	7.9	15.9	11.7	13.8	10.0
8	31	16.0	14.3	19.2	11.6	31.3	8.4	15.7	14.4	16.1	13.3
9	30	12.3	10.9	13.9	9.3	20.7	2.8	10.5	11.4	13.8	9.4
10	31	10.4	8.9	12.9	6.3	18.6	2.6	9.9	9.9	11.1	7.2
11	30	2.6	2.6	4.3	.5	12.0	-4.9	6.6	4.8	7.2	2.2
12	31	-.4	-1.9	.4	-2.7	4.5	-11.4	6.2	2.9	4.2	1.6
YEARLY VALUES:	231	10.3	8.6	12.8	6.5	31.3	-11.4	15.9	8.9	16.1	1.6

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 4

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	.9	.4	2.2	-1.4	4.7	-7.8	7.1	2.6	2.7	2.2
2	28	1.8	1.4	2.7	.1	4.5	-7.8	7.2	1.5	2.7	.5
3	31	4.4	3.6	6.9	1.7	12.7	-1.2	11.4	1.9	3.3	1.1
4	30	5.9	6.2	9.0	3.4	19.4	0.0	14.6	3.5	6.6	2.2
5	31	11.5	11.1	15.4	7.5	25.2	4.6	16.3	7.4	9.4	6.1
6	30	14.1	13.4	18.2	9.4	26.9	5.8	15.5	9.2	10.5	7.7
7	31	17.0	15.8	21.2	12.1	30.4	7.1	16.5	11.3	13.3	8.8
8	31	16.2	15.2	19.5	12.1	24.5	8.4	13.8	13.2	13.8	12.7
9	30	15.1	13.6	17.9	10.7	25.2	7.4	12.9	12.9	13.8	12.2
10	31	10.9	9.9	12.7	7.7	20.2	3.2	10.5	10.9	12.2	8.8
11	30	5.6	5.0	7.1	3.3	12.0	-1.9	6.6	6.5	8.3	3.8
12	31	5.3	5.1	6.5	3.7	10.3	-.6	7.1	3.8	5.0	2.7
YEARLY VALUES:	365	9.1	8.4	11.7	5.9	30.4	-7.8	16.5	7.1	13.8	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 4

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	.2	-.3	1.6	-1.7	7.3	-12.0	7.6	2.3	4.4	1.1
2	29	3.3	2.9	4.5	1.7	8.8	-3.8	4.8	1.8	3.3	1.6
3	31	4.0	3.7	5.3	2.5	9.5	.4	5.5	2.8	3.8	1.6
4	30	8.8	7.2	11.8	4.3	22.0	1.1	13.2	4.8	7.7	2.7
5	31	11.0	9.9	13.8	7.2	25.5	2.5	16.2	7.3	7.7	6.6
6	30	12.0	11.3	14.3	9.1	20.6	5.2	12.2	8.4	9.4	6.6
7	31	16.8	14.3	20.0	11.7	27.1	8.5	13.1	10.6	12.2	8.8
8	31	14.8	13.7	17.7	10.6	26.4	5.1	12.2	10.8	11.6	10.0
9	30	13.4	11.9	15.8	9.3	22.4	4.9	14.9	9.9	10.5	8.8
10	31	10.0	9.5	12.7	6.4	21.2	1.0	10.1	8.5	10.5	6.6
11	30	6.0	5.5	7.4	3.8	13.5	.6	7.7	5.7	7.7	4.4
12	31	4.1	4.1	5.3	2.9	12.6	-4.1	5.2	3.3	6.6	1.6
YEARLY VALUES:	366	8.7	7.8	10.9	5.7	27.1	-12.0	16.2	6.4	12.2	1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 4

DATA YEAR 1981

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	6.6	5.8	7.9	4.5	12.1	1.8	5.4	4.9	6.1	3.8
2	28	4.2	3.5	5.8	2.1	9.6	-3.6	8.0	3.1	3.8	1.6
3	31	6.3	5.5	8.5	3.1	13.5	.1	9.5	4.2	5.0	3.3
4	30	6.6	5.8	8.8	4.4	18.6	.6	9.6	3.8	6.6	2.2
5	31	9.7	8.7	12.2	6.5	22.0	3.1	13.6	6.5	8.8	3.8
6	30	11.3	11.0	13.9	8.4	23.8	5.1	12.8	8.2	9.4	7.7
7	31	15.4	13.9	18.6	11.5	26.5	6.6	13.0	10.3	11.6	8.8
8	31	17.4	18.1	22.5	13.1	30.9	9.3	14.1	12.3	13.8	11.1
9	30	13.5	12.1	16.5	9.5	26.7	5.2	12.4	10.7	12.2	8.3
10	31	7.9	7.4	10.1	4.9	15.9	2.4	9.1	7.1	8.8	6.1
11	30	6.1	5.4	7.5	4.0	13.1	-.5	5.8	5.7	7.2	3.3
12	31	2.9	2.5	3.8	1.3	8.4	-1.9	5.1	3.0	3.8	2.2
YEARLY VALUES:	365	9.0	8.3	11.4	6.1	30.9	-3.6	14.1	6.7	13.8	1.6

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 4

DATA YEAR 1982

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	.7	.5	1.4	-.3	4.1	-12.0	7.5	1.9	2.7	1.1
2	28	1.6	1.1	2.9	-.5	7.2	-6.8	7.3	2.1	3.3	1.1
3	31	3.7	2.7	5.3	1.3	12.1	-.1	10.3	2.1	2.7	1.6
4	30	4.7	4.5	7.7	1.8	16.9	0.0	15.1	2.5	3.8	1.6
5	31	9.9	9.0	13.6	5.6	21.7	.5	13.9	5.5	7.2	3.3
6	30	15.3	13.6	19.0	10.8	30.0	4.7	15.0	9.2	11.6	6.6
7	31	16.1	14.2	19.6	11.1	29.1	7.2	14.7	11.5	13.3	9.4
8	31	16.5	15.0	19.9	11.8	26.2	8.0	12.3	12.4	13.3	11.6
9	30	13.4	12.4	16.2	9.5	25.3	4.4	11.2	12.9	14.4	11.6
10	31	8.2	8.6	10.6	6.0	14.8	1.3	7.6	10.4	11.6	8.8
11	30	3.3	3.5	4.8	1.9	10.4	-1.2	5.8	4.8	8.8	1.6
12	31	2.9	2.5	4.0	1.2	8.9	-2.3	6.9	2.0	3.3	1.1
YEARLY VALUES:	365	8.1	7.4	10.5	5.0	30.0	-12.0	15.1	6.5	14.4	1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 5

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
5	17	8.8*	6.6*	11.5*	4.4*	20.8*	0.0*	13.0*	4.3*	5.0*	0.0*
6	30	13.9	11.5	17.5	9.1	27.8	4.2	14.1	7.7	9.4	5.0
7	31	15.9	13.8	19.4	11.1	31.6	7.0	14.0	10.9	13.3	8.3
8	31	15.8	14.7	19.3	12.0	34.4	8.2	13.9	12.0	13.3	11.1
9	30	11.7	10.7	13.6	9.2	22.6	4.0	14.6	10.6	11.6	9.4
10	31	11.3	10.0	14.0	7.4	21.7	2.3	11.6	10.1	11.1	8.3
11	30	3.1	2.5	4.6	.7	13.3	-3.9	9.0	5.3	8.3	2.2
12	31	-1.3	-1.7	.1	-3.6	4.7	-14.9	10.4	1.8	2.2	1.1
YEARLY VALUES:	231	10.0	8.6	12.6	6.4	34.4	-14.9	14.6	8.1	13.3	0.0

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 5

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.2	-.9	1.4	-2.6	4.5	-10.7	10.5	1.5	2.2	1.1
2	28	1.2	.7	2.3	-.6	4.4	-7.6	7.2	1.2	1.6	1.1
3	31	4.7	3.4	6.7	1.9	13.0	-2.2	9.1	.9	1.6	.5
4	30	5.2	4.9	7.5	2.8	19.1	0.0	12.5	1.5	3.8	.5
5	31	10.6	9.9	14.6	6.8	25.9	2.6	16.8	5.1	7.2	3.8
6	30	13.9	12.1	18.0	8.9	27.1	5.3	14.4	8.7	10.5	6.1
7	31	17.2	15.5	21.2	12.4	31.8	4.6	14.1	11.1	12.7	9.4
8	31	15.7	14.8	19.0	12.0	26.0	9.0	12.3	12.0	12.7	11.6
9	30	15.3	13.7	17.9	11.0	27.4	6.6	12.5	11.9	12.2	11.1
10	31	11.1	10.1	13.0	8.2	23.7	3.0	9.8	9.8	11.6	6.6
11	30	6.2	5.6	7.6	4.2	14.3	-1.9	6.5	5.9	6.6	5.0
12	31	4.6	4.5	6.0	3.1	11.9	-1.0	9.1	4.0	5.0	3.3
YEARLY VALUES:	365	8.8	7.9	11.3	5.7	31.8	-10.7	16.8	6.2	12.7	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 5

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.3	-.5	1.4	-2.5	6.4	-12.0	7.7	2.5	3.8	-.5
2	29	4.2	3.9	5.4	2.5	8.8	-4.5	6.0	2.0	2.7	1.6
3	31	3.7	3.2	4.6	2.1	10.3	.1	5.3	1.9	2.7	1.1
4	30	8.7	6.4	11.1	4.8	24.2	.7	13.0	3.3	6.1	1.6
5	31	10.7	9.1	13.2	7.1	24.1	2.7	13.6	6.2	7.2	5.5
6	30	11.9	10.7	14.2	8.9	20.8	4.6	12.1	7.3	8.3	6.1
7	31	17.2	15.2	20.8	12.4	31.3	8.8	13.9	9.9	11.6	8.3
8	31	15.0	13.9	18.0	11.3	28.3	6.9	11.2	9.1	11.6	8.1
9	30	14.2	12.7	16.6	10.3	25.4	5.9	11.4	8.0	8.6	6.9
10	31	12.0	10.3	14.2	8.3	26.1	2.9	10.4	7.8	9.4	6.1
11	30	5.5	4.9	7.0	3.6	14.8	-1.7	7.8	5.0	7.2	3.3
12	31	5.6	5.5	6.9	4.1	13.5	-4.5	6.1	2.9	5.0	1.6
YEARLY VALUES:	366	9.0	8.0	11.1	6.1	31.3	-12.0	13.9	5.5	11.6	-.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 5

OATA YEAR 1981

MONTH	NUMBER OF OAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	6.8	6.0	8.1	4.8	12.1	.4	6.1	3.9	4.4	2.7
2	28	4.2	3.7	5.9	2.2	10.6	-5.6	8.2	2.1	2.7	1.6
3	31	6.1	5.5	8.1	3.6	15.0	.1	8.5	2.7	3.3	2.2
4	30	5.7	5.7	8.6	3.9	20.2	-1.5	10.5	2.3	3.8	1.6
5	31	8.4	8.2	11.5	6.1	22.8	2.8	13.2	4.1	6.6	2.5
6	30	11.3	10.3	13.6	8.3	24.3	6.1	12.8	8.0	10.0	6.6
7	31	15.9	13.9	18.9	11.4	28.8	6.4	13.4	10.7	12.2	9.4
8	31	20.4	17.2	23.9	14.9	34.0	10.5	14.0	13.2	14.4	11.6
9	30	14.7	12.7	17.2	10.8	29.9	6.0	12.6	11.8	13.3	10.0
10	31	9.0	7.7	10.6	5.9	18.2	2.5	10.1	9.0	14.4	7.7
11	30	6.6	5.7	7.9	4.7	16.6	-.2	8.4	7.1	8.3	5.5
12	31	2.0	1.8	3.1	.8	7.6	-3.0	5.5	1.2	5.0	.5
YEARLY VALUES:	365	9.3	8.2	11.5	6.5	34.0	-5.6	14.0	6.4	14.4	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 5

DATA YEAR 1982

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	.2	.1	1.1	-.9	4.3	-11.9	7.1	.1	1.9	-.5
2	28	1.1	.5	2.3	-1.1	6.5	-7.2	9.0	-.8	0.0	-1.1
3	31	2.9	1.6	4.0	.8	10.2	-1.8	6.9	-.8	0.0	-1.1
4	30	4.0	2.5	5.9	1.0	13.1	-2.2	9.2	-.2	1.3	-.5
5	31	9.7	6.7	12.4	5.1	22.3	1.2	13.7	4.6	6.4	.5
6	30	15.3	12.5	18.7	10.5	29.9	5.1	15.3	8.3	10.5	5.9
7	31	16.4	13.4	19.7	11.1	30.9	7.3	13.7	10.4	12.2	9.4
8	31	16.1	15.5	19.8	12.1	28.6	7.2	12.1	11.6	12.2	11.1
9	30	13.1	12.2	16.0	9.7	27.5	4.0	11.5	11.0	12.9	10.0
10	31	8.8	8.0	10.6	6.1	19.8	1.8	8.2	8.9	10.0	7.2
11	30	2.6	1.9	3.5	1.0	10.0	-2.7	5.2	4.6	7.2	2.7
12	31	1.1	.7	2.1	-.4	7.4	-4.0	6.6	2.4	2.7	1.6
YEARLY VALUES:	365	7.6	6.3	9.7	4.6	30.9	-11.9	15.3	5.1	12.9	-1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 6

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
6	24	10.4*	8.2*	14.1*	5.9*	24.0*	2.2*	17.6*	8.3*	10.5*	6.6*
7	31	14.5	12.2	18.7	9.0	28.5	5.2	16.2	10.7	13.8	8.8
8	31	14.0	12.2	17.6	9.5	31.9	5.4	16.3	12.6	15.5	10.5
9	30	10.0	8.3	12.0	6.5	23.3	.9	12.7	10.0	12.7	7.7
10	31	10.9	9.3	14.4	6.6	23.6	1.1	13.3	9.3	10.5	6.1
11	30	1.5	1.0	3.4	-1.0	13.8	-5.8	9.0	2.9	7.2	-.5
12	31	-3.8	-4.2	-1.7	-6.2	4.2	-17.6	10.8	2.2	3.3	0.0
YEARLY VALUES:	208	8.2	6.7	11.1	4.3	31.9	-17.6	17.6	8.0	15.5	-.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 6

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-2.3	-1.9	.1	-4.3	4.2	-11.1	9.7	2.4	2.7	2.2
2	28	-.3	-.5	1.3	-2.4	4.4	-9.9	6.8	2.2	2.7	1.6
3	31	3.4	3.1	6.7	.8	12.9	-6.5	10.9	2.1	2.7	1.6
4	30	4.2	3.2	7.2	1.2	17.0	-1.3	12.7	2.2	2.2	2.2
5	31	9.7	6.5	13.3	4.4	24.0	1.6	17.7	5.4	8.8	2.2
6	30	11.3	11.6	16.7	7.0	26.3	3.3	16.4	7.3	9.4	6.1
7	31	16.1	13.8	20.4	10.6	32.6	3.3	16.3	10.6	12.7	6.6
8	31	14.4	13.5	18.2	10.4	25.8	6.8	13.5	11.4	12.2	10.5
9	30	14.1	13.5	17.9	10.0	28.1	0.0	13.3	10.3	11.6	0.0
10	31	9.5	10.6	13.3	7.8	24.6	2.5	12.2	8.6	10.5	5.5
11	30	4.5	5.0	6.9	2.8	13.7	-3.9	7.3	5.2	6.6	3.3
12	31	3.3	3.3	4.9	1.8	10.4	-2.3	8.8	2.2	4.4	1.6
YEARLY VALUES:	365	7.4	6.9	10.6	4.2	32.6	-11.1	17.7	5.8	12.7	0.0

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 6

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-1.4	-1.9	.4	-3.9	6.9	-12.9	11.7	1.3	2.7	.5
2	29	3.6	2.8	5.0	1.5	9.2	-6.8	7.9	1.3	1.6	.5
3	31	2.7	2.0	4.1	.8	9.0	-1.8	7.1	1.5	1.6	1.1
4	30	7.1	4.8	10.3	3.1	21.4	-.1	14.3	1.8	3.3	1.1
5	31	8.5	9.3	13.1	5.8	23.8	2.2	17.8	5.8	7.2	3.8
6	30	10.0	11.1	13.8	7.6	21.8	3.5	15.5	7.8	10.0	5.5
7	31	14.6	16.7	20.3	11.3	30.7	7.7	15.5	11.5	13.8	9.4
8	31	13.3	14.2	17.6	10.0	27.4	5.4	13.4	12.1	13.8	10.5
9	30	12.7	12.8	16.8	9.3	25.5	4.9	13.7	10.9	12.2	9.4
10	31	11.6	8.9	14.2	7.0	26.4	1.2	13.7	9.0	12.2	7.2
11	30	4.9	4.9	7.3	3.3	13.9	-4.8	6.1	4.8	8.3	3.3
12	31	4.2	3.9	6.1	2.4	11.0	-.5	7.6	3.2	7.7	1.6
YEARLY VALUES:	366	7.7	7.5	10.8	4.9	30.7	-12.9	17.8	5.9	13.8	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 6

DATA YEAR 1981

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	4.7	3.6	5.8	2.5	12.6	-6.3	7.1	4.4	6.1	3.3
2	28	3.1	2.8	5.7	1.0	12.2	-7.3	9.5	2.0	3.3	1.1
3	31	4.9	5.1	8.3	2.2	16.7	-.8	12.0	3.1	3.8	2.2
4	30	4.7	4.3	8.3	2.2	22.1	-4.4	14.5	2.1	5.5	1.1
5	31	7.8	8.3	11.6	5.3	24.4	1.4	14.9	5.3	8.8	2.3
6	30	10.3	9.2	13.1	6.8	25.0	3.9	17.1	8.0	10.0	6.6
7	31	14.6	13.2	19.3	10.4	28.8	3.9	14.4	11.4	13.8	9.4
8	31	19.6	16.2	23.8	13.3	34.4	7.9	14.7	14.2	16.1	11.6
9	30	13.6	12.1	17.0	9.4	31.5	4.5	14.5	11.5	15.0	8.3
10	31	8.3	6.9	10.8	4.7	20.3	1.7	12.0	7.3	8.8	5.5
11	30	5.3	4.8	7.2	3.4	15.9	-1.5	9.5	5.1	7.2	3.3
12	31	.9	.8	2.3	-.3	6.5	-4.6	4.8	1.4	2.2	1.1
YEARLY VALUES:	365	8.2	7.3	11.1	5.1	34.4	-7.3	17.1	6.3	16.1	1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 6

DATA YEAR 1982

MONTH	NUMBER OF DAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.1	-.4	1.1	-1.8	5.9	-13.0	7.4	1.2	1.6	.9
2	28	.9	-.1	2.5	-1.8	8.1	-8.0	9.9	.1	1.1	-2.1
3	31	1.5	.4	3.9	-1.3	9.9	-6.1	11.0	-1.3	1.1	-2.9
4	30	4.0	2.6	6.8	.2	17.8	-4.0	13.3	.2	1.1	-2.1
5	31	7.9	5.9	12.4	3.9	21.7	.5	14.4	1.0	2.7	.5
6	30	13.8	11.4	18.3	8.7	28.8	3.4	15.9	7.1	10.0	2.7
7	31	15.7	12.3	19.9	10.1	31.6	5.5	15.1	10.5	13.3	8.3
8	31	15.9	13.8	20.2	10.8	30.6	6.8	15.1	12.2	13.3	11.1
9	30	13.0	10.9	16.2	8.8	28.7	3.2	14.3	10.7	14.7	8.3
10	31	8.0	7.2	10.2	5.2	21.3	-.4	9.6	7.2	11.0	4.4
11	30	2.3	2.2	4.2	.8	10.9	-4.4	6.4	2.6	4.7	1.1
12	31	.1	-.3	1.5	-1.6	8.4	-7.2	7.2	.5	2.2	0.0
YEARLY VALUES:	365	7.0	5.5	9.8	3.5	31.6	-13.0	15.9	4.4	14.7	-2.9

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 7

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
6	24	8.7*	9.8*	13.4*	6.0*	24.9*	1.9*	15.1*	6.8*	8.8*	5.5*
7	31	14.4	10.9	18.3	9.0	28.7	3.8	15.2	10.3	12.7	8.3
8	31	13.5	10.8	16.7	8.9	32.5	3.8	15.7	11.8	15.0	8.8
9	30	8.9	7.3	11.0	5.5	25.2	.3	15.8	8.8	11.1	5.5
10	31	10.5	8.2	13.1	5.5	22.8	-2.8	16.5	8.6	10.0	5.5
11	30	.9	.1	2.8	-1.8	14.7	-9.9	9.6	3.1	6.6	1.1
12	30	-5.2	-5.7	-2.9	-8.0	3.0	-22.6	10.1	.9	1.6	.5
YEARLY VALUES:	207	7.4	5.9	10.3	3.6	32.5	-22.6	16.5	7.2	15.0	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 7

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-5.1	-6.3	-3.4	-8.2	1.3	-13.5	13.1	.9	1.1	.5
2	28	-2.1	-2.9	-.8	-4.4	3.7	-13.6	7.4	.7	1.1	0.0
3	31	3.8	2.8	6.1	.3	12.9	-7.9	10.7	.4	.5	0.0
4	30	4.4	2.7	6.4	1.0	16.1	-3.4	10.7	.4	.5	0.0
5	31	8.8	6.6	11.7	4.9	22.2	.9	13.3	.6	3.3	0.0
6	30	11.1	8.6	14.5	6.1	24.1	1.4	14.1	6.6	10.0	3.8
7	31	15.1	13.4	18.5	10.4	29.8	1.7	12.6	10.9	14.4	5.0
8	31	14.1	12.4	17.2	10.0	27.5	7.6	15.5	12.0	13.3	9.4
9	30	13.9	12.3	16.6	9.6	27.1	4.1	14.1	11.1	12.7	9.4
10	31	9.6	8.5	11.6	6.4	23.0	.6	11.6	8.5	11.6	4.4
11	30	4.7	4.6	6.7	2.5	15.6	-5.1	8.0	5.8	7.2	5.0
12	31	3.1	2.7	4.6	1.3	10.5	-4.9	10.7	4.3	5.0	3.8
YEARLY VALUES:	365	6.8	5.5	9.2	3.4	29.8	-13.6	15.5	5.2	14.4	0.0

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 7

OATA YEAR 1980

MONTH	NUMBER OF DAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-2.8	-3.7	-.8	-5.5	9.1	-15.7	10.3	1.6	3.8	-.7
2	29	3.5	3.0	5.3	.8	9.8	-10.2	10.1	4.0	4.4	3.8
3	31	1.3	.3	2.4	-1.0	7.8	-3.5	7.4	3.8	3.8	3.8
4	30	6.7	5.1	9.1	2.9	19.0	-2.3	13.0	4.0	4.4	3.8
5	31	7.7	6.2	9.9	4.4	19.8	0.0	13.1	5.0	6.1	3.8
6	30	9.1	8.1	11.5	5.9	18.8	1.2	11.7	7.6	10.0	4.4
7	31	15.4	13.2	18.4	10.6	28.0	6.2	13.1	12.6	15.0	10.0
8	31	13.3	11.4	15.8	9.1	25.6	3.6	10.9	12.6	15.0	10.0
9	30	12.2	12.1	16.1	9.3	24.5	3.7	13.6	11.2	13.3	8.8
10	31	10.8	9.7	13.6	7.0	26.9	1.6	14.2	7.7	11.1	5.0
11	30	4.0	3.3	5.6	1.5	16.3	-2.8	9.6	2.9	6.6	1.1
12	31	4.2	3.9	5.8	2.2	15.9	-8.7	7.8	1.3	3.3	.5
YEARLY VALUES:	366	7.1	6.0	9.4	3.9	28.0	-15.7	14.2	6.2	15.0	-.7

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 7

DATA YEAR 1981

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	5.5	4.7	7.0	3.3	13.1	-4.0	6.7	2.6	3.3	1.6
2	28	3.0	2.1	4.9	.0	11.4	-10.7	11.5	1.4	1.6	1.1
3	31	4.3	2.6	6.0	.8	14.1	-3.3	10.4	1.1	1.1	1.1
4	30	3.8	3.7	6.4	.8	18.3	-4.6	12.1	.8	1.1	.5
5	31	6.6	5.6	8.6	3.5	21.7	-.6	12.6	1.9	6.1	.5
6	30	9.0	7.8	11.1	5.8	22.7	2.3	12.3	5.4	7.7	2.7
7	31	14.2	12.0	17.1	9.4	26.9	3.0	12.9	8.6	11.6	4.4
8	31	18.9	15.7	22.0	13.4	32.0	7.3	14.4	12.2	14.4	10.0
9	30	12.7	10.5	15.0	8.3	28.4	1.4	13.6	9.8	13.8	5.0
10	31	6.5	5.1	8.5	3.2	20.0	-.9	12.4	4.6	7.2	1.1
11	30	3.4	2.4	4.7	1.1	16.5	-3.7	12.2	2.8	5.5	1.1
12	31	-1.6	-1.6	-.0	-3.2	5.3	-7.6	7.1	.8	1.6	.5
YEARLY VALUES:	365	7.2	5.9	9.3	3.9	32.0	-10.7	14.4	4.4	14.4	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 7

DATA YEAR 1982

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-2.6	-3.3	-1.5	-4.7	3.2	-15.9	7.2	.5	1.1	-.4
2	28	-2.1	-3.0	-.6	-4.8	4.6	-12.7	10.3	.3	.5	0.0
3	31	-.5	-1.4	1.4	-3.3	9.9	-6.6	9.3	.3	.5	-.5
4	30	.3	-.4	2.8	-3.1	13.7	-7.8	10.8	.2	.5	0.0
5	31	5.2	4.1	7.5	1.6	16.7	-3.2	10.8	0.0	0.0	0.0
6	30	10.3	8.6	12.9	6.7	21.9	-.4	12.3	2.0	5.0	0.0
7	31	13.3	10.5	16.3	8.1	27.3	2.6	13.9	7.1	12.2	4.4
8	31	14.6	12.0	17.3	9.4	27.5	4.4	12.5	9.2	11.1	7.7
9	30	11.2	9.8	13.7	7.3	25.3	.4	10.5	9.0	11.1	6.6
10	31	5.8	5.3	7.8	3.0	20.6	-4.3	8.8	6.1	10.9	2.2
11	30	1.4	.4	2.6	-.6	8.3	-7.1	5.9	1.8	3.8	-.2
12	31	.0	-.6	1.6	-2.2	7.7	-7.9	6.8	1.1	1.6	1.1
YEARLY VALUES:	365	4.8	3.5	6.9	1.5	27.5	-15.9	13.9	3.1	12.2	-.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE B

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
5	16	7.4*	4.7*	11.1*	2.4*	20.6*	-.2*	15.2*	4.8*	6.1*	4.4*
6	30	13.8	11.1	18.2	8.3	26.8	4.5	17.2	8.4	10.5	6.1
7	31	16.4	13.0	20.7	9.9	30.5	6.0	17.3	11.6	14.4	8.8
8	31	15.4	12.4	18.8	9.9	33.7	5.5	18.0	12.0	15.0	10.0
9	30	10.3	8.5	12.1	6.9	22.1	1.4	12.5	9.5	11.6	7.2
10	31	9.9	7.1	12.3	5.2	20.0	-1.1	11.0	8.4	10.0	5.5
11	30	.8	-.3	2.1	-1.9	11.5	-7.5	8.1	3.7	6.6	1.6
12	31	-4.0	-4.5	-2.3	-6.9	1.7	-18.1	9.6	1.8	2.2	1.1
YEARLY VALUES:	230	8.8	6.6	11.7	4.3	33.7	-18.1	18.0	7.7	15.0	1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 8

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-2.9	-4.4	-1.2	-6.2	3.6	-11.8	10.3	1.0	1.6	.5
2	28	-.6	-1.5	.7	-3.2	4.7	-11.7	9.5	3.8	6.6	1.1
3	31	3.5	1.5	5.8	-.1	12.1	-7.4	9.7	2.1	6.6	.5
4	30	4.5	2.0	7.0	.5	15.9	-3.0	11.5	1.9	5.5	1.1
5	31	9.2	8.1	14.1	4.3	25.8	.5	18.2	6.4	8.8	5.0
6	30	12.8	11.0	17.4	6.9	26.4	1.7	16.3	8.6	11.1	6.6
7	31	15.7	14.7	21.2	10.1	32.6	2.8	15.4	10.8	13.3	6.6
8	31	14.0	14.1	19.0	9.9	27.6	5.9	17.4	11.0	12.2	9.8
9	30	12.0	12.3	15.7	8.5	26.2	3.9	13.2	10.4	11.6	9.4
10	31	8.6	7.7	11.0	5.3	23.1	-.8	11.4	7.7	9.8	5.0
11	30	2.9	1.7	4.3	.6	11.9	-6.7	6.8	3.8	5.0	2.2
12	31	1.4	1.0	2.8	-.4	8.0	-5.1	9.4	1.9	3.3	1.1
YEARLY VALUES:	365	6.8	5.7	9.9	3.1	32.6	-11.8	18.2	5.8	13.3	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 8

OATA YEAR 1980

MONTH	NUMBER OF OAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-3.3	-3.8	-1.5	-6.1	4.7	-16.5	10.1	1.0	1.6	.5
2	29	1.8	1.1	3.2	-.3	7.4	-9.7	8.3	.9	1.1	.5
3	31	.6	.2	2.2	-1.4	6.3	-4.1	6.0	1.0	1.1	.5
4	30	5.3	4.3	8.7	1.4	20.9	-3.2	17.2	3.0	6.6	1.1
5	31	7.3	7.5	11.6	3.9	22.5	-.4	19.4	5.9	7.2	4.4
6	30	9.3	8.0	12.5	5.7	22.1	1.7	17.1	7.2	8.8	5.0
7	31	15.3	12.7	20.2	9.3	30.2	5.1	15.7	10.3	12.7	8.3
8	31	13.7	10.3	17.3	7.7	26.3	1.1	13.9	10.2	12.2	8.3
9	30	11.7	9.6	15.2	7.0	22.3	3.1	14.4	9.0	11.1	7.2
10	31	9.4	7.0	12.2	4.5	25.0	-.9	14.6	7.2	11.1	4.4
11	30	3.1	2.4	5.5	.7	13.6	-3.5	10.6	4.6	6.5	2.7
12	31	3.5	2.9	5.2	1.4	12.2	-7.7	7.4	3.2	4.8	2.2
YEARLY VALUES:	366	6.5	5.2	9.4	2.8	30.2	-16.5	19.4	5.3	12.7	.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 9

DATA YEAR 1978

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
6	24	10.8*	8.8*	13.9*	6.9*	24.2*	3.8*	12.3*	8.5*	10.0*	5.7*
7	31	14.3	12.0	18.0	9.5	28.3	4.2	13.3	10.5	12.7	8.8
8	31	15.0	12.7	17.9	10.8	32.3	6.8	14.1	11.5	14.4	9.4
9	30	10.1	9.0	12.2	7.0	24.3	1.8	13.8	9.3	11.1	7.7
10	31	11.9	9.6	14.4	7.2	22.9	1.2	14.9	9.0	10.0	6.6
11	30	3.2	2.1	5.5	.6	18.3	-5.9	15.5	3.8	7.2	.9
12	30	-.3	-1.2	1.7	-3.3	8.5	-15.4	11.0	1.2	1.6	1.1
YEARLY VALUES:	207	9.3	7.6	11.9	5.5	32.3	-15.4	15.5	7.7	14.4	.9

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 9

DATA YEAR 1979

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.8	-1.2	1.3	-2.6	8.6	-8.0	8.4	.6	1.1	.3
2	28	.6	.4	2.1	-.8	6.0	-8.1	5.9	.5	.9	-.2
3	31	5.8	5.0	8.1	2.9	14.2	-3.6	9.1	.2	.3	-.2
4	30	6.3	4.8	8.4	3.5	17.1	0.0	10.1	.2	.3	-.2
5	31	10.2	8.0	13.2	6.5	22.5	3.4	12.8	.4	3.0	-.2
6	30	12.4	10.1	15.9	7.7	24.4	3.5	12.9	6.5	10.0	3.5
7	31	16.0	13.7	19.8	11.2	31.9	2.8	13.8	10.2	12.2	7.2
8	31	15.1	12.7	18.0	11.0	26.2	8.8	13.3	11.3	12.2	11.1
9	30	15.0	12.9	17.6	10.3	26.3	5.2	13.0	11.0	12.2	10.0
10	31	10.9	9.4	12.9	7.9	24.5	2.2	10.5	8.8	11.6	4.1
11	30	6.2	6.0	8.6	4.0	16.7	-2.7	8.3	5.6	6.8	4.4
12	31	3.6	3.6	5.2	2.2	11.9	-3.0	10.7	3.1	4.4	2.2
YEARLY VALUES:	365	8.5	7.1	11.0	5.4	31.9	-8.1	13.8	4.9	12.2	-.2

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 9

DATA YEAR 1980

MONTH	NUMBER OF DAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.6	-.5	1.6	-2.1	10.9	-9.8	8.1	1.9	3.5	-.9
2	29	5.5	5.1	7.5	3.3	11.5	-5.4	8.8	3.7	4.1	3.5
3	31	3.6	2.9	4.9	1.9	9.7	-.1	6.4	3.5	3.5	3.5
4	30	8.3	6.8	10.8	4.9	19.7	.8	12.3	3.7	4.1	3.5
5	31	8.6	6.5	11.1	5.2	20.4	.4	12.3	4.9	6.1	3.5
6	30	9.6	8.6	12.2	6.7	19.2	3.6	12.3	6.7	8.9	4.4
7	31	15.0	13.4	18.5	10.6	28.1	7.6	12.8	10.6	14.4	8.8
8	31	13.0	13.3	16.8	10.3	26.8	5.5	10.9	11.0	14.4	10.0
9	30	13.3	12.1	16.7	9.9	24.8	5.7	12.1	10.0	11.1	8.3
10	31	12.1	10.0	14.4	8.1	26.7	3.1	13.7	8.5	11.1	5.2
11	30	5.9	5.3	7.8	3.9	17.3	.4	9.1	2.7	6.2	.9
12	31	6.2	5.8	7.9	4.4	16.9	-4.2	7.8	1.1	3.0	.3
YEARLY VALUES:	366	8.4	7.5	10.9	5.6	28.1	-9.8	13.7	5.7	14.4	-.9

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE IO

OATA YEAR 1979

MONTH	NUMBER OF OAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-6.3	-8.6	-4.7	-9.5	0.0	-15.1	13.3	-1.3	0.0	-1.6
2	28	-3.2	-4.9	-2.1	-5.5	2.4	-15.2	7.6	-1.5	0.0	-2.0
3	31	2.8	1.4	4.8	-.5	11.6	-9.2	10.6	-1.7	0.0	-2.0
4	30	3.4	1.2	5.1	.2	14.8	-4.5	10.0	-1.7	0.0	-2.0
5	31	8.0	5.4	10.5	4.2	21.0	0.0	12.5	-1.5	.9	-2.0
6	30	10.0	7.7	13.0	5.5	22.9	.6	13.6	2.9	4.7	1.1
7	31	13.8	12.9	17.2	9.8	29.0	.5	11.4	6.8	10.0	2.2
8	31	14.8	12.7	17.0	10.8	25.3	8.1	12.9	8.7	9.4	8.3
9	30	13.5	12.2	15.8	9.3	25.3	3.6	12.6	8.4	10.0	7.2
10	31	9.0	7.9	10.3	6.0	21.4	0.0	9.2	6.2	8.8	3.3
11	30	2.9	2.0	4.5	.8	12.4	-6.0	6.9	2.9	3.3	2.7
12	31	2.1	1.3	3.3	.5	9.2	-6.1	10.5	1.7	2.3	1.3
YEARLY VALUES:	365	6.0	4.3	7.9	2.7	29.0	-15.2	13.6	2.5	10.0	-2.0

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 10

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-3.9	-5.8	-2.2	-6.7	7.8	-17.5	10.5	-.6	1.3	-2.6
2	29	2.5	1.6	4.0	-.0	8.5	-11.7	9.8	1.5	1.8	1.3
3	31	.2	-1.4	1.1	-1.9	6.5	-4.6	7.1	1.3	1.3	1.3
4	30	5.8	3.9	7.8	2.1	17.8	-3.3	12.4	1.5	1.8	1.3
5	31	6.5	5.1	7.9	4.1	18.6	.3	12.4	.9	1.8	.5
6	30	6.6	6.6	8.8	4.3	16.3	1.7	10.5	1.2	3.3	.5
7	31	13.2	12.4	17.0	9.5	27.4	3.6	12.8	6.8	9.4	3.8
8	31	12.3	10.3	14.5	8.3	24.3	2.7	9.8	7.8	9.4	6.1
9	30	11.7	10.0	13.5	8.0	21.3	3.1	11.7	6.9	8.3	5.5
10	31	9.7	8.4	11.7	6.3	23.6	1.1	11.7	5.8	8.8	3.8
11	30	3.1	2.0	4.4	.8	14.0	-2.7	9.5	1.2	5.0	-1.1
12	31	3.3	2.6	4.5	1.4	14.6	-10.1	7.0	-.9	.9	-1.6
YEARLY VALUES:	366	5.9	4.6	7.8	3.0	27.4	-17.5	12.8	2.8	9.4	-2.6

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 11

OATA YEAR 1979

MONTH	NUMBER OF OAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.7	-.9	.5	-2.3	5.0	-9.7	6.9	3.0	5.5	-.5
2	28	1.4	1.2	2.4	.0	5.8	-6.2	5.0	3.0	3.4	2.5
3	31	2.9	3.1	5.3	.9	9.1	-2.4	7.7	1.8	3.3	1.1
4	30	5.8	5.5	7.8	3.6	15.2	.7	8.6	2.8	2.9	2.5
5	31	8.7	8.6	12.2	6.1	21.0	3.6	14.4	3.8	8.8	2.5
6	30	12.6	12.8	16.8	8.9	25.7	3.7	14.4	8.9	10.0	7.7
7	31	14.8	15.9	19.5	11.4	28.3	5.6	12.4	11.4	13.3	8.8
8	31	14.5	15.2	18.0	11.8	23.2	8.8	12.3	12.0	12.7	11.1
9	30	12.4	12.9	15.0	9.9	20.1	5.9	8.0	11.7	12.7	11.1
10	31	8.6	9.2	10.8	6.9	16.0	3.2	7.9	9.7	11.1	7.7
11	30	3.5	4.4	5.5	2.8	9.2	-1.8	6.0	6.3	7.7	4.4
12	31	4.7	4.3	5.9	2.9	11.7	-1.6	7.9	5.4	6.6	4.4
YEARLY VALUES:	365	7.5	7.7	10.0	5.3	28.3	-9.7	14.4	6.7	13.3	-.5

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 11

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-.1	-.4	1.1	-1.8	6.9	-10.2	6.1	3.5	5.5	2.2
2	29	5.2	5.7	7.0	3.5	10.4	-3.9	7.5	5.7	6.0	5.5
3	31	3.7	3.6	4.8	2.3	8.9	.6	5.4	5.5	5.5	5.5
4	30	7.4	7.2	9.9	4.7	17.3	1.4	10.4	5.9	7.2	5.5
5	31	9.2	8.5	11.6	6.1	19.8	2.0	12.8	7.2	7.7	6.6
6	30	9.0	9.7	11.7	6.9	17.3	3.8	9.5	8.6	10.5	6.0
7	31	14.7	14.1	18.2	11.0	25.3	7.3	12.4	10.8	12.7	9.4
8	31	13.2	12.2	15.8	9.9	23.0	5.4	10.2	11.6	12.2	10.9
9	30	11.0	11.4	13.5	8.7	20.7	6.2	8.6	10.7	11.3	9.4
10	31	8.3	8.5	10.8	5.7	19.0	.7	7.3	8.9	11.1	7.2
11	30	5.4	5.5	6.9	3.9	12.6	.6	5.9	5.6	8.8	3.4
12	31	5.7	6.4	7.4	4.4	15.1	-2.9	6.7	3.6	5.1	2.9
YEARLY VALUES:	366	7.7	7.7	9.9	5.4	25.3	-10.2	12.8	7.3	12.7	2.2

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 12

OATA YEAR 1978

MONTH	NUMBER OF OAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
7	14	16.6*	13.2*	20.4*	10.9*	25.3*	7.0*	15.1*	8.8*	10.0*	7.2*
8	31	13.4	11.2	15.6	9.0	29.3	4.2	11.8	10.0	12.7	8.3
9	30	7.2	6.3	9.2	4.0	22.7	-1.7	13.5	6.7	9.4	4.4
10	31	9.7	7.3	11.8	5.0	20.8	-3.0	16.0	6.9	22.7	4.4
11	30	-.4	-1.8	1.7	-3.5	15.7	-12.4	12.5	2.3	4.4	1.1
12	31	-3.5	-4.1	-2.4	-5.5	2.8	-12.0	8.6	1.1	1.1	1.1
YEARLY VALUES:	167	6.2	4.6	8.3	2.6	29.3	-12.4	16.0	5.7	22.7	1.1

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL OATA SUMMARY

SITE 12

OATA YEAR 1979

MONTH	NUMBER OF DAYS	OAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-4.3	-4.2	-1.9	-5.6	1.6	-11.9	7.6	.2	1.1	-.3
2	28	-2.8	-2.8	-.6	-3.7	1.4	-11.9	7.7	-1.0	.1	-1.9
3	31	.3	-.6	4.1	-2.1	10.5	-5.1	13.0	-.7	.7	-1.4
4	30	2.1	2.1	6.3	-.4	17.9	-3.8	16.8	.9	3.8	-.3
5	31	8.7	7.1	13.4	3.9	24.2	.9	18.8	4.5	6.4	3.3
6	30	11.4	9.2	16.1	5.6	26.1	.8	18.2	6.2	8.8	4.8
7	31	13.9	11.0	16.2	8.5	27.0	.8	12.3	8.8	11.1	5.0
8	31	13.1	10.8	15.3	8.5	23.5	6.3	13.7	10.3	11.1	9.4
9	30	13.5	10.5	19.3	7.8	35.6	1.3	28.0	9.6	11.1	8.3
10	31	9.4	6.7	13.7	4.7	37.7	-1.6	26.3	7.2	10.5	2.2
11	30	3.5	2.1	6.7	.3	21.8	-7.5	18.2	2.8	3.8	2.7
12	31	1.2	1.0	3.1	-.6	8.6	-7.1	10.8	1.7	2.7	1.1
YEARLY VALUES:	365	5.9	4.4	9.3	2.3	37.7	-11.9	28.0	4.3	11.1	-1.9

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

MOUNT RAINIER NATIONAL PARK

METEOROLOGICAL DATA SUMMARY

SITE 12

DATA YEAR 1980

MONTH	NUMBER OF DAYS	DAY MEAN AIR TEMP (C)	NIGHT MEAN AIR TEMP (C)	MEAN MAXIMUM AIR TEMP (C)	MEAN MINIMUM AIR TEMP (C)	ABSOLUTE MAXIMUM AIR TEMP (C)	ABSOLUTE MINIMUM AIR TEMP (C)	ABSOLUTE RANGE AIR TEMP (C)	MEAN SOIL TEMP (C)	ABSOLUTE MAXIMUM SOIL TEMP (C)	ABSOLUTE MINIMUM SOIL TEMP (C)
1	31	-3.0	-3.0	-1.5	-4.3	2.0	-16.0	7.8	1.0	1.6	-.3
2	29	-1.0	-1.3	1.4	-2.1	6.2	-7.7	5.5	-.7	.7	-.9
3	31	-.2	-.4	2.3	-1.3	6.9	-3.4	6.7	.2	1.2	-.9
4	30	5.5	3.1	9.5	.5	20.7	-2.7	15.3	2.1	4.8	.1
5	31	6.5	4.2	8.8	2.3	24.6	-2.5	18.6	2.1	4.8	1.6
6	30	8.2	5.8	12.6	4.2	31.0	-.7	24.3	3.9	6.1	1.6
7	31	15.6	10.9	22.4	8.6	39.3	4.1	30.1	8.0	10.0	5.5
8	31	12.0	9.1	14.7	7.4	32.5	2.3	27.7	8.3	10.0	6.6
9	30	11.1	9.3	13.5	7.1	22.5	2.2	11.5	7.3	8.8	5.5
10	31	9.8	7.8	11.9	5.9	23.5	-.1	12.2	6.1	9.4	3.8
11	30	1.9	1.3	4.4	-.3	15.6	-4.5	10.7	2.3	5.0	.5
12	31	-.0	-.0	2.3	-.9	10.4	-8.0	5.7	.7	3.8	-.9
YEARLY VALUES:	366	5.6	3.9	8.6	2.3	39.3	-16.0	30.1	3.4	10.0	-.9

TEMP = temperature; (C) = degrees Celsius.
Values followed by an asterisk (*) have more than 5 missing days.

*GPO 597 - 448 (1985)

Greene, Sarah E.; Klopsch, Mark. Soil and air temperatures for different habitats in Mount Rainier National Park. Res. Pap. PNW-342. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; **1985.** 50 p.

This paper reports air and soil temperature data from 10 sites in Mount Rainier National Park in Washington State for 2- to 5-year periods. Data provided are monthly summaries for day and night mean air temperatures, mean minimum and maximum air temperatures, absolute minimum and maximum air temperatures, range of air temperatures, mean soil temperature, and absolute minimum and maximum soil temperatures. A temperature growth index has also been calculated. Temperature lapse rates are given for one major drainage, Nisqually. The objective is to provide these data for the use of managers, field scientists, and modelers.

Keywords: Temperature (air), temperature (soil), habitat types, Washington (Mount Rainier National Park).

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